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"STUDY OF ETIOLOGICAL FACTORS AND ANALYSIS OF VARIOUS SURGICAL REPAIR TECHNIQUES FOR PARAUMBLICAL HERNIA"

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BONAFIDE CERTIFICATE

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DECLARATION

I, certainly declare that this dissertation titled **"STUDY OF ETIOLOGICAL FACTORS AND ANALYSIS OF VARIOUS SURGICAL REPAIR TECHNIQUES FOR PARAUMBLICAL HERNIA"** represents a genuine work of mine. The contributions of any supervisors to the research are consistent with normal supervisory practice, and are acknowledged.

I, also affirm that this bonafide work or part of this work was not submitted by me or any others for any award, degree or diploma to any other University board, either in India or abroad. This is submitted to The Tamil Nadu Dr. M.G.R Medical University, Chennai in partial fulfilment of the rules and regulations for the award of Master of Surgery Degree Branch I (General Surgery).

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"Surgery is learnt by apprenticeship and not from textbooks, not even from one profusely illustrated" – Ian Aird.

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INTRODUCTION

INTRODUCTION

Umbilical hernia is a protrusion of a viscus or part of a viscus through the umbilical cicatrix. In infants it is through a weak umbilical scar. Umbilicus can develop a hernia at any age. In children, umbilical hernias are the third most common disorder after hydroceles and inguinal hernias. The hernia is present in about one to five every birth, the incidence in black infants being up to eight times higher than in white infants. Predisposing factors are a low birth weight and prematurity [(1)]. But in adults, formation of Umbilical hernia is a multifactorial and complex process, but chronically increased intra-abdominal pressure and weakened fascial tissue at the umbilicus are of utmost importance, they are most commonly found along the midline linea alba .

Although umbilical hernias are amongst the commonly occurring abdominal wall defects, not much work has been done to record the incidence. Western studies quote an incidence of 4.65% among all types of hernias. Umbilical hernias are relatively common type in adult population, more common in overweight, multiparous female between the ages of 35 and 50. Women are affected with umbilical hernias 3 to 5 times more frequently than men [(2)]. Since women are the predominant cases, umbilical hernias can cause distress to these patients not only because of their complications but also because of the cosmetic angle.

In 90% of the patient it is an acquired defect that is a direct result of increase abdominal pressure. In adults, umbilical hernias are due to a lot of risk factors like ascites, obesity, malignancy, multi parous status, older age, emphysema, asthma and other chronic lung conditions, prostatism, abdominal distension, steroid use, coughing and lifting weight [3, 4]. A familial predisposition appears in 9 to 12%, but no genetic pattern of inheritance has been identified [1].

This study attempts to evaluate the demographic features, clinical features, risk factors, operative techniques and post operative course of umbilical hernias in adults.

This study also attempts to investigate the possibility of subclinical hypothyroidism as a risk factor for umbilical hernias in adults. Still there is no consensus as to the most ideal technique for umbilical hernia repair in adults. So this study is needed to get a more conclusive perspective on the type of repair for umbilical hernia.

AIMS & OBJECTIVES OF THE STUDY

AIMS AND OBJECTIVES

- To evaluate the demographic features, clinical features, risk factors, operative techniques and post operative course of umbilical hernias in adults.
- To find the possibility of hypothyroidism, being a risk factor for umbilical hernias.
- To compare the outcomes of primary suture repair with mesh repair of umbilical hernias.

REVIEW OF LITERATURE

REVIEW OF LITERATURE

Introduction

Hernia is derived from the Latin word (*hernia),* which means rupture. A hernia is defined as an abnormal protrusion of an organ or tissue through a defect in its surrounding walls. Although a hernia can occur at various sites of the body, these defects most commonly involve the abdominal wall. Abdominal wall hernias occur only at site where the aponeurosis and fascia are not covered by the striated muscles [(4)]. Umbilical hernia is a protrusion of a viscus or part of a viscus through the umbilical cicatrix.

These sites of hernia most commonly include the inguinal, femoral, and umbilical areas, the linea alba, the lower portion of the semilunar line, and sites of prior incisions [(4)]. The hernial sac is lined by peritoneum and protrudes from the neck. Neck or orifice of a hernia is located at the innermost musculoaponeurotic layer. There is no consistent relationship between the area of a hernia defect and the size of a hernia sac [(4)].

The most common finding of a hernia is a mass or bulge on the anterior abdominal wall, which may increase in size with a Valsalva maneuver. Ventral hernias may be asymptomatic or enlarge over time generally and cause a considerable degree of discomfort. Physical

examination reveals a bulge on the anterior abdominal wall that may reduce spontaneously, with recumbency or with manual pressure [7]. A hernia is *reducible* when its contents can be replaced within the surrounding musculature [4].

A hernia that cannot be reduced is described as *incarcerated (irreducible)* and it often requires an emergent surgical correction. Incarceration of an intestinal segment may be accompanied by significant pain, nausea and vomiting [4, 7].

When the blood supply to the incarcerated bowel gets compromised, the hernia is called as *strangulated*, and this localized ischemia may lead to infarction and perforation, which becomes a serious and potentially fatal complication [4].

Hernia can be external or internal. An *external* hernia protrudes through all layers of the abdominal wall, whereas an *internal* hernia is a protrusion of intestine through a defect within the peritoneal cavity [4]. An *interparietal* hernia occurs when the hernia sac is contained within a musculoaponeurotic layer of the abdominal wall. In broad terms, most abdominal wall hernias can be separated into inguinal and ventral hernias. Primary ventral hernias (nonincisional) are also termed *true* ventral hernias. European Hernia society (EuraHS) defines Primary ventral hernia as, "a ventral hernia that was present at birth or that developed

spontaneously without trauma to the abdominal wall as the cause of the hernia. These are more properly named according to their anatomic location.

Umbilical hernia

European Hernia society also defines Umbilical hernia as "A primary ventral hernia with its centre at the umbilicus" [8]. Umbilical hernia is nothing but the protrusion of a viscus or part of a viscus through the umbilical cicatrix. In infants it is through a weak umbilical scar. Umbilicus can develop a hernia at any age. In children, umbilical hernias are the third most common disorder after hydroceles and inguinal hernias. It is seen in about one in every five birth, its incidence among the black infants being up to eight times more than in whites. Predisposing factors are prematurity and low birth weight in newborns [1]. Umbilical hernia is markedly increased in premature infants and it is as many as 75% of infants under 1500g of birth weight. But the rate of spontaneous resolution is higher in newborns. It is estimated that as many as 10% to 20% of all infants are born with an umbilical hernia [9].

But in adults, formation of Umbilical hernia is a multifactorial and complex process, but weakened fascial tissue at the umbilicus and chronically increased intra-abdominal pressure are most important

factors, these umbilical hernias are most commonly found along the midline linea alba .

Anatomy and Pathophysiology

The most important in the embryology of the umbilical defect is the fusion of embryonic mesoderm and ectoderm to form the umbilical ring - fascial margin. An abdominal wall defect is present from the third week of gestation onwards to allow the passage of the umbilical vein and the umbilical arteries to the cord. After birth, thrombosis of both the arteries and the vein occurs, which facilitates contraction of the umbilical ring by cicatrisation.

Superior aspect being the weakest area of the umbilical ring, which is between the umbilical vein and the cranial margin of the ring. In the obliterated umbilical vein, the relative lack of elastic fibres is factor responsible for such a weakness. This is the typical site for umbilical herniation in the children, where the newly formed scar is subjected to elevated intra abdominal pressures or impairment in cicatrisation.

Orda and Nathan have found that the round ligament of the liver attaches to the inferior portion of the umbilical ring in about three-fourths of individuals, thus providing an additional layer preventing umbilical hernia, along with the transversalis fascia and peritoneum [(10)]. The rate of

spontaneous resolution is high. It is estimated that only 10% of adults with an umbilical hernia have a history of childhood umbilical hernia. The incidence is more in infants of African descent, and is increased in association with certain disease conditions such as Beckwith - Wiedemann syndrome, Down's syndrome. No significant gender differences noted [(2)]. It means the adult umbilical hernia does result from the persisting juvenile hernia.

The anatomical margins of the so-called umbilical canal (in adults) are the umbilical fascia from posterior, the linea alba from anterior and the medial edges of the rectus sheaths. Adult umbilical hernia is an acquired condition, which represents the probable influence of increased intra-abdominal pressure causing herniation through the umbilical canal [(11)].

Although umbilical hernias are amongst the commonly occurring abdominal wall defects, not much work has been done to record the incidence. Western studies quote an incidence of 4.65% among all types of hernias. These hernias are relatively common type in adult population, more common in overweight, multiparous female of the age between 35 and 50. Women are affected with umbilical hernias 3 to 5 times more frequently than men [(12)]. Since women are the predominant cases, umbilical hernias can cause distress to such patients not only because of their complications but also because of the cosmetic angle.

The etiology for the umbilical hernia is multifactorial, but of utmost important is the chronically increased intra-abdominal pressure and weakened fascial tissue at the umbilicus [12].

In 90% of the patient, it is an acquired defect that is a direct result of increased abdominal pressure. In adults, umbilical hernias are due to a lot of risk factors like ascites, obesity, malignancy, multiparous state, coughing, lifting weight, older age, emphysema, asthma and other chronic lung conditions, prostatism, abdominal distension and steroid use [3, 4]. A familial predisposition seen in 9 to 12% of the cases, but no genetic pattern of inheritance as such [1]. Ascites is a contributing factor and it makes the hernia more difficult to treat.

Adhesions between the hernia contents and the peritoneal covering of the sac can provide a tethering point, which entraps the hernial contents and predisposes to intestinal obstruction and strangulation. Strangulation occurs more often in large hernias that have small neck. Here, the small orifice of the hernia obstructs arterial blood flow or venous drainage or both to the hernia sac contents [4].

A very unusual type of strangulation is a Richter's hernia. In Richter's hernia, a small portion of the antimesenteric wall of the intestine is trapped within the hernia, and strangulation can occur without the presence of intestinal obstruction.

The hernias can be quite large, with fascial defects of 10 to 15 cm, but most are smaller than 5 cm in diameter. The hernia sac may contain omentum, colon, and small bowel. Baccari described the presence of omentum alone or in combination with small or large bowel in about 60% of patients and Small bowel alone and large bowel was found in 4% and 7%, respectively [13]. These hernias prone to incarceration because of the adhesions from the omentum and bowel to the hernial sac and the relatively small size of the fascial defect compared with the large amount of sac contents.

Patients usually presents with a complaint of pain or a lump at the umbilicus. The pain can be of "dragging" sensation and can be quite sharp and acute, when associated with coughing, straining, or incarceration of the abdominal contents. In Joaquin et al study, 39% of patients are asymptomatic at the time when hernia is discovered, 61% have experienced pain, pressure, nausea, or vomiting. Of these, pain is the most common complaint, occurring in 44% of patients, followed by pressure in 20% and nausea and vomiting in 9% [12].

In the same study, Joaquin et al reported, "Umbilical hernias are seen in 20% of patients with ascites. Though spontaneous rupture of the hernia with leakage of ascites is infrequently seen. But it has a 10% to 20% mortality rate when emergently repaired" [12].

In a prospective single centre study it was noted that, 5 patients had their hernia since childhood and in 6 patients the hernia developed following laparoscopic cholecystectomy. In the remaining 51 patients (>82%) the hernia developed following different predisposing factors, relative obesity and multiparity being the commonest association (59% and 30% respectively). Other causes included chronic cough (19%), incisional hernia (14.5%), prostatic disease (11%), ascites (4.8%), malignant diseases (3%), and work entailing lifting heavy objects (3%) [14]. Only one patient had hypothyroidism (1.6%). Umbilical hernia is one of the most common clinical sign (51%) associated with of Hypothyroidism in new born [15, 16]. With best of our knowledge, there is no much data available in the literature about the association of umbilical hernia and hypothyroidism in adult population.

Diagnosis:

Diagnosis in most of the cases can be done usually by taking a proper complete history about the pain and the umbilical lump and physical examination. The incarcerated sac or protrusion of the sac through the fascial ring can be palpated with straining manoeuvres. In morbidly obese patients in whom it is difficult to perform an adequate abdominal physical examination, the diagnosis can be made by an abdominal computed tomographic scan.

Classification :

European Hernia Society classification for primary abdominal wall hernias classified all the primary abdominal wall hernias in to Midline and lateral, umbilical hernia is a midline hernia which is further classified into small, medium and large with respect to size of the hernia [17].

EHS Primary Abdominal Wall Hernia Classification		Diameter cm	Small <2cm	Medium ≥2-4cm	Large ≥4cm
Midline	Epigastric				
	Umbilical				
Lateral	Spigelian				
	Lumbar				

Similarly, EUS classified midline incisional hernias (between the two lateral margins of the rectus muscle sheaths) in to five zones,

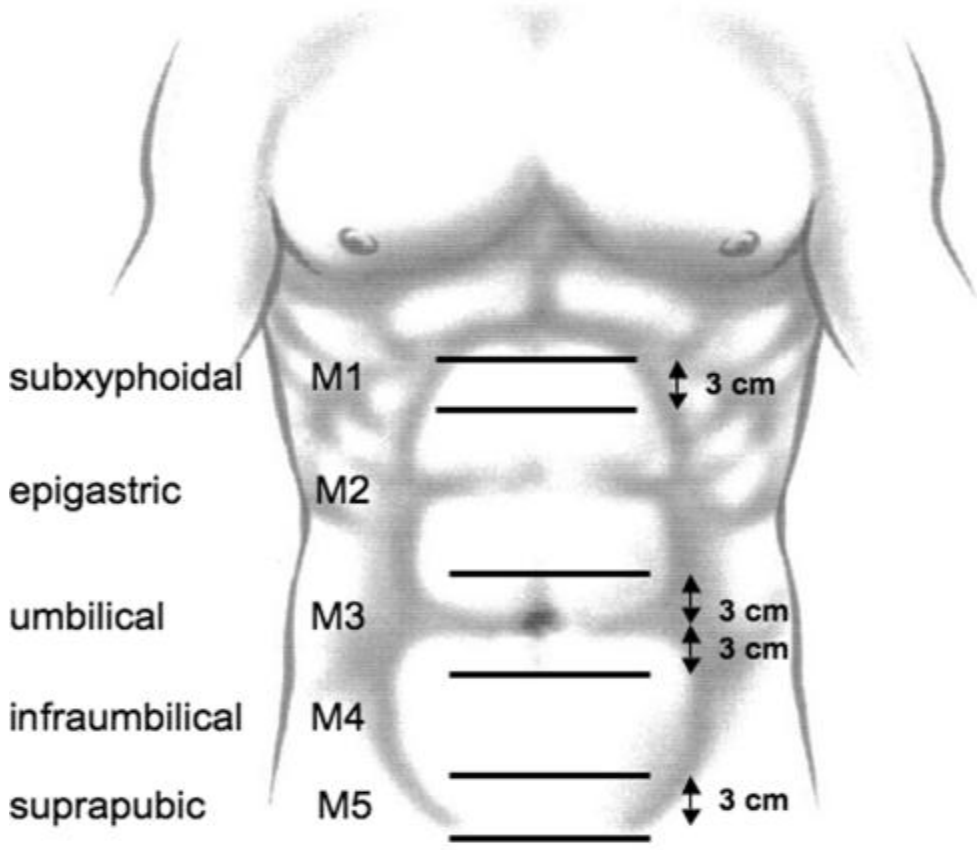
(1) M1: subxiphoidal (from the xiphoid till 3 cm caudally)

(2) M2: epigastric (from 3 cm below the xiphoid till 3 cm above the umbilicus)

(3) M3: umbilical (from 3 cm above till 3 cm below the umbilicus)

(4) M4: infraumbilical (from 3 cm below the umbilicus till 3 cm above the pubis)

(5) M5: suprapubic (from pubic bone till 3 cm cranially) [17].



If left untreated umbilical hernia may result in complications like strangulation, incarceration or spontaneous rupture [18, 19, 20]. Development of complications is unpredictable but when these complications appear, a simple situation will become a difficult and urgent problem. The frequency of intestinal obstruction is ~37.5%; prophylactic repair should be always done between 2 and 4 years from the time of detection.

Umbilical hernias will continue to enlarge if left untreated and are prone to incarceration and thus they should be considered for repair at the time of presentation. The patient with asymptomatic, small, flat umbilical

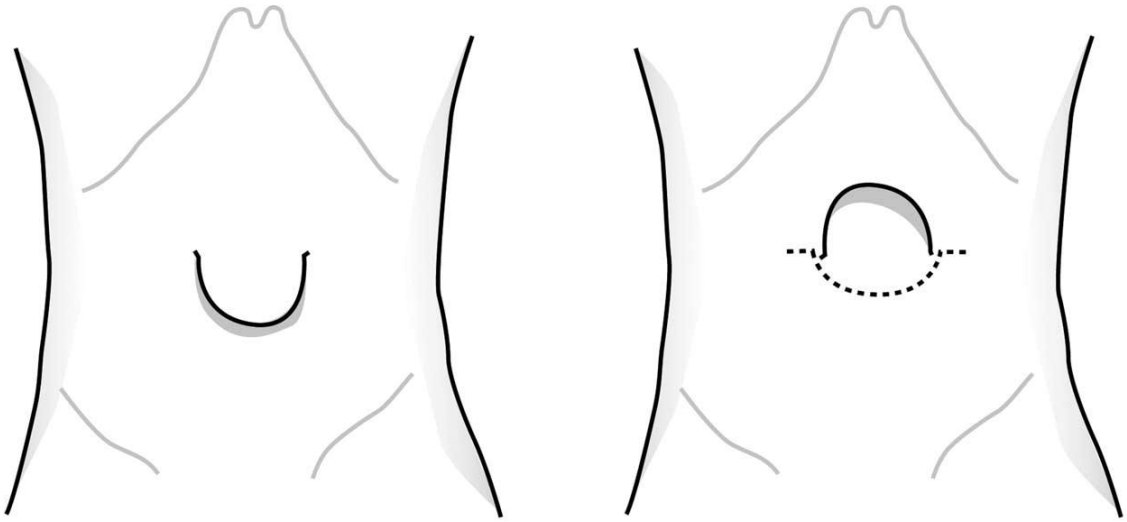
hernia that has not changed over a long time may be the exception to this rule. Such cases should be re-examined at frequent intervals. Spontaneous rupture of umbilical hernia can occur and becomes an emergency surgical problem. Spontaneous rupture is very common in cirrhotics [20, 21] and there are cases of rupture of the umbilical hernias reported during pregnancy with gravid uterus due to increased intraabdominal pressure [19]. Mixter in 1901 reported the first case of spontaneous rupture of an umbilical hernia from ascites [22]. The precipitating factors for a rupture include local trauma and a sudden increase in intra-abdominal pressure, such as coughing, vomiting or esophagoscopy. Straining for stool has not yet been reported in the literature as a cause of acute rupture of an umbilical hernia. The presence of chronic elevation of intra-abdominal pressure, such as with ascites, activities and patient positions cause further increase in intra-abdominal pressure which can overwhelm the strength of the anterior abdominal wall layers [23]. Ascites can also be caused by renal failure other than cirrhosis and cause similar effect.

The method of hernia repair is a more difficult question. Smaller (3 cm) first-time hernias in nonobese patients may be primarily repaired by suturing the fascial edges together.

The first repair of umbilical hernia was performed by Mayo (1907) by making horizontal imbrications of edges of the fascial defect. Farris

et al. described simple transverse closure with interrupted nonabsorbable suture material.

The Mayo technique and the modifications of Mayo's technique are not acceptable in the present time, a recurrence rate of 20% and higher are not acceptable for any surgical procedure. Evidence from one retrospective study suggests that the repair of umbilical hernias larger than 3 cm should be performed using prosthetic mesh in order to prevent the high recurrence rates of primary repair of larger hernias. The same study reported an overall recurrence rate of 13% [(24)].



Incision

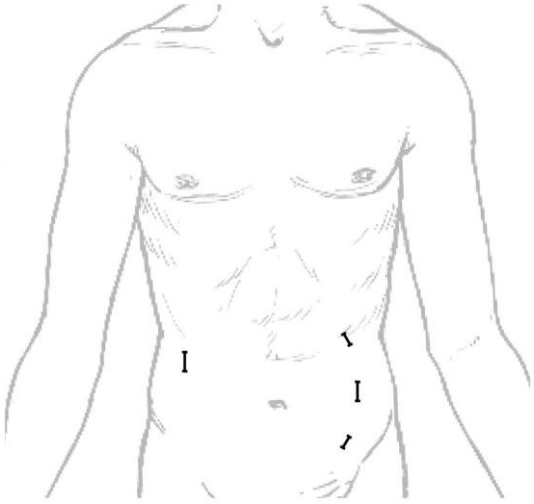
Dissection of neck of hernia sac.

In the review article Hope and Hooks says, “a thorough knowledge of anatomy, appropriate preoperative planning, and reliance on the principles of hernia repair ensure successful outcomes. There are many options for repair, including technique and mesh choice. The hernia surgeon should be well versed in the open and laparoscopic approaches and apply them based on the individual clinical presentation” [25].

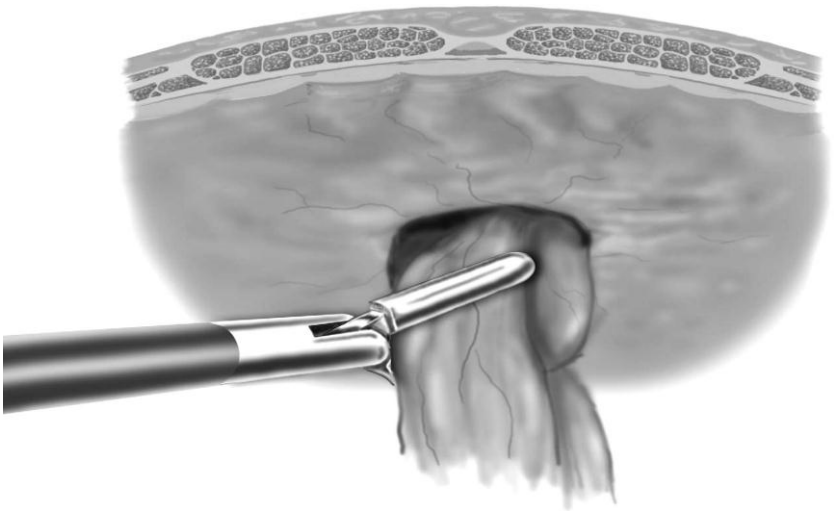
In the present day modern surgical practice, the available surgical options for the treatment of umbilical hernia are anatomical repair, open and laparoscopic repair with mesh [26].

Laparoscopic umbilical hernia repair is a safe and effective technique, even after multiple previous abdominal surgeries. It requires less than 24 hours hospitalization and it also allows for identification of

previously undiagnosed second hernia defects as well [26]. When compared with open mesh repair, Laparoscopic repair resulted in less number of postoperative drains, shorter return to activity, and lower complication and lower recurrence rates. The same study also reported, No much statistical difference in recurrence rates between the primary suture repair and open mesh repair groups [26].



Port placement



Reduction of hernia contents.

As the evolution of surgical techniques, a large population-based study showed a dramatic increase in the use of mesh from 34.2% in 1987 to 65.5% in 1999 for incisional hernia repairs [5]. In Farrow et al study, in the first 2 years 24% of umbilical hernias were repaired with mesh compared with the last 2 years of the study, when 60% were repaired with mesh (P <.001) [27].

Most approaches are performed around the umbilicus by means of a semilunar infra-umbilical incision which passes through the subcutaneous fat and exposing the rectus fascia. Smith-Behn and Katz [28] proposed a transumbilical approach with the idea of improving the aesthetic appearance of the umbilicus and preserving the original shape of the umbilicus and tried to avoid, total resection of the umbilicus if possible. In Mexico it has been proposed in by Vega- Rasgado[29] and Ibanez-Fuentes et al [30] as an alternative to surgical repair of umbilical hernia. Recently, a similar study in Mexico showed clearly superior cosmetic results in their patients using the transumbilical approach [31].

Because of their size, the common practice is to repair the umbilical hernia defect with primary sutures. But primary repair has got high rates of recurrences. In prospective randomized study from Spain, A. Arroyo et al after a mean follow-up of 64 months reported recurrence of 11% with the suture repair than with mesh repair 1% [32]. Arroyo et al did

not show significantly increased recurrence rates related to size greater or less than 3 cm (8% and 5%, respectively) or to body mass index [32]. If we can borrow from the literature on incisional and other ventral hernia repairs, recently recurrence rates of 1% have been reported through the use of prosthetic mesh in all size umbilical hernias and pre-peritoneal mesh is thought to become the standard even in umbilical hernia as it is in inguinal and incision hernia repair [33].

There is question raised that, whether all the umbilical hernia repairs should be performed with mesh or mesh should be used only in high-risk groups with recurrence. If it is placed, what is best the position for the mesh.

EuraHS definitions of mesh position in ventral hernia repair

Onlay:

The onlay position if the mesh is positioned above the abdominal wall muscles and fascia, behind the subcutaneous fat

Inlay:

The inlay position if the mesh is positioned in the hernia defect, without overlap, and fixed to the margins of the defect

Retromuscular-Medial hernias:

The retromuscular position for medial abdominal wall hernias if the mesh is positioned behind the rectus abdominis muscle and in front of

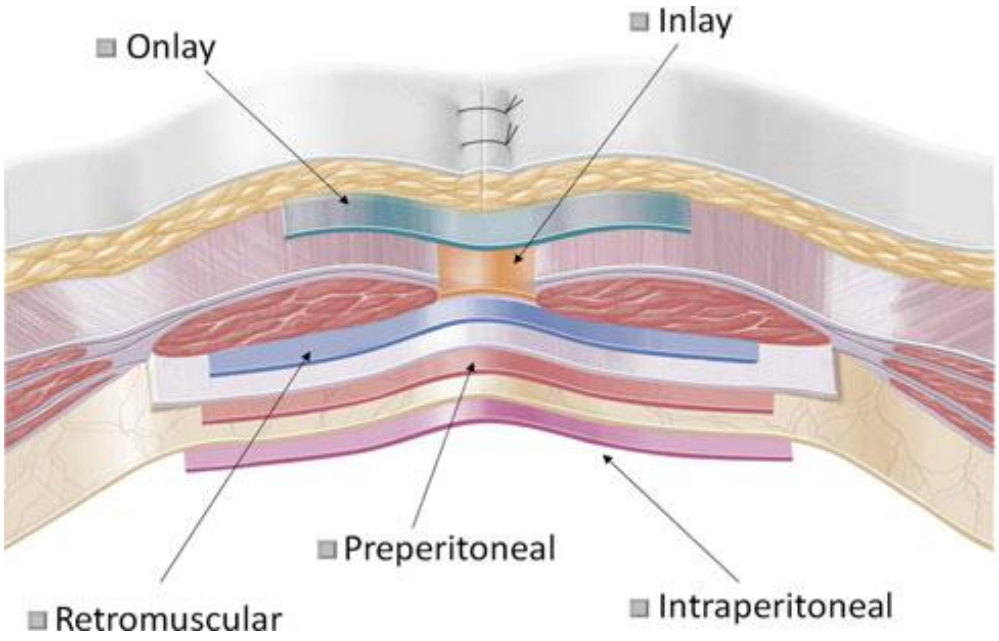
the posterior rectus fascia or -caudal to the linea arcuata- in front of the peritoneum

Preperitoneal:

The preperitoneal position if the mesh is placed in the plane behind all abdominal wall muscles in front of the peritoneum

Intraperitoneal:

The intraperitoneal position if the mesh is placed behind all layers of the abdominal wall including the parietal peritoneum [8].



EuraHS terminology of mesh positions during ventral hernia repair

There are three zones in hernia surgery: the white zone in elective hernia surgery where there is a common consensus on use of mesh, the gray zone which is surgery with a possible risk of bacterial contamination like incarcerated hernia, and lastly, the black zone in frankly

contaminated areas such as in peritonitis where the common consensus is not to position any kind of prosthetic material due to a very high risk of infection. Most surgeons in such situations are concerned regarding the complications associated with foreign material implantation in the incarcerated or strangulated bowel loops. Several studies have reported beneficial outcomes of mesh hernioplasty in emergency situations without intestinal resection.

Robert Castro- Jose E. Rodriguez reported that, "The laparoscopic onlay patch repair is associated with less recurrence, lower wound morbidity, shorter hospital stay, and lower postoperative pain when compared with open suture repair and open surgical mesh repair of umbilical hernia is associated with less recurrence than open suture repair, but there is controversy surrounding the infection rates associated with this repair" [(34)].

Nieuwenhuizen et al. [(33)] reported high wound infection rates in patients requiring intestinal resection. Mesh is not routinely used by many surgeons in the repair of acute hernias. The most common explanation given for the use of primary suture repair is the fear of wound complications post-operatively with mesh, especially in cases in which small or large bowel is incarcerated in the hernia sac, which sometimes even necessitating bowel resection [(33)]. Other complications include

seromas, wound infections, fistula formation, mesh extrusion, and adhesions [26].

It is argued that the use of mesh in smaller hernias is time consuming, is more difficult and placement of mesh in a small (less than 2 cm's) hernia will lead to enlargement of the fascial defect. Atila et al [35] and Legnani et al. [36] found that wound infections will be of low incidence of in acute hernia repaired with the use of prosthetic mesh. This also corresponds to other studies involving the use of prosthetic mesh in contaminated hernias. In Atila et al study, " the risk of intestinal resection is significantly greater when the duration of incarceration exceeds 6 h (P ¼ 0.001), 81% of Group I patients came to the hospital after 6 h vs. 31% in Group II which may explain why we had a high incidence (29%) of resection" [35].

It is said that the Polyprolene meshes are considered as the most ideal mesh for use in contaminated or clean contaminated surgical fields as in incarcerated or strangulated hernias. The wide pores measuring >70 microns of these meshes allow free contact between bacteria, whose diameters measures 1 micron, and the immunes system cells (Eg. granulocytes and macrophages) which measures 15-20 microns in diameter. This explains the lower probability of infection and allowing recovery from infections even if it occurs [37, 38].

Infections occur in 15% to 45% of patients following open hernia repair with mesh materials [26]. These infections closely correlate with recurrence rates.

It is recommended to use the alloplastic mesh for umbilical hernia repair for patients with a BMI greater than 30.0 and hernia orifice larger than 3 cm. In hernial gaps from 2 to 3 cm, the decision for use of a mesh should depend on individual factors [39]. The same study reported recurrence rate related to the hernia orifices. In patients with a hernial gap lesser than 1 cm, the rate of recurrence was 6.3%, hernial orifices from 1 to 2 cm the rate was 4.1%, from 2 to 3 cm 14.3%, from 3 to 4 cm 25.0% and patients with hernial gaps larger than 4 cm had the rate of recurrences of 54.5% [39] . Another similar study found recurrence of 13% with anatomical and no recurrence with mesh [40] and no relationships were found between wound infection or obesity and umbilical hernia recurrence [40].

In a randomised control study of 160 patients who underwent either suture repair or mesh or autodermal skin graft , Korenkov et al, reported fewer infectious complications after the suture repair (3 out of 33) than in the other group. They discontinued the trial because of the severity of the infections after polypropylene mesh implantation and they have not noticed any differences in the duration of stay in hospital and quality of life. But, after polypropylene mesh repair, pain was

significantly more frequent (pooled risk ratio 2.9 and 1.8 at 6 weeks and 1 year respectively) [41].

In a study, they used the physical and numerical models to evaluate the impact of the defect size, the mesh overlap and the fixation depth on ventral hernia repair [42]. They concluded that "Increase in the defect size and decrease of the overlap significantly affect the Ventral Hernia Repair mechanical performances. Such numerical models could help to understand better about the behaviour of the repaired abdominal wall and finally to reduce the clinical complications" [42].

Nienhuijs et al in his randomised control trial of 334 patients open inguinal hernia repair , who were allocated blindly and at random to receive one of the three meshes for open inguinal hernia repair, reported that these three meshes namely Lichtenstein method, mesh plug repair and the prolene hernia system did not show any clinically significant short or long term results in postoperative pain and affect the quality of life and they explained that the severe early postoperative pain reliably predicted the likelihood of persisting chronic groin pain [43].

In another similar prospective randomised control trial on comparison of prosthetic mesh repair and tissue repair in the emergency management of incarcerated Para-umbilical hernia from Alexandria, Egypt, Abdel-baki reported, for emergency management of incarcerated

Para-umbilical hernia , the use of prosthetic repair is safe and as superior results, with regard to recurrence, compared with conventional tissue repair. The presence of non-viable intestine is not regarded as a contraindication for prosthetic repair [44].

In another prospective study by Eryilmaz to investigate the repair techniques in umbilical hernias of adult patients who underwent primary umbilical hernia operation between 1998 and 2003 were reviewed. For defects less than 3 cm, primary repair was conducted, whereas larger defects were repaired with polypropylene mesh. During the follow up, postoperative complications, the length of hospital stay, and recurrence in were recorded. Recurrence rate was significantly higher in the primary repair group (14%) compared with polypropylene mesh repair group (2%). In contrary to the general tendency of repairing small defects primarily, this study concluded that "polypropylene mesh should be used in all umbilical hernias regardless of the size of the defect" [45].

In a retrospective study by Tollens et al to determine the long-term recurrence and complication rates following small abdominal wall hernia repair in 135 patients with the Ventralex hernia patch. After the mean follow up period of 49months (with range of 13 to 70 months), they noted 12(8.9%) recurrences and 1-month postoperative complications included seroma (4%), superficial surgical site infections (3%), and abscess

formation (1.5%). After the mean long-term follow-up, complications were infection (1.5%) and subobstruction (1.5%). The only statistically significant risk factor for hernia recurrence in this study was female gender. In those patients with recurrence of hernia, reported significantly lower quality of life scores than patients without the recurrence [46]. Amato et al did a study about the need for mesh fixation and sufficient overlap of the defect by the mesh. In this study they described a modified technique based upon a newly developed mesh with a special design for ventral and incision hernia repair. This implant of new type was intended not to be point-fixated. This unique geometrically shaped mesh consists of a large central body and the radiating arms, which are used to repair ventral or incisional hernia. It allows broader coverage of the abdominal wall which results in tension- and fixation-free repair. In this study, this newly designed type of mesh was placed in 22 cases in the preperitoneal space by sublay technique in incisional or ventral hernias. After a midterm follow-up of 18-24 (mean 22) months, one infection occurred, which was managed successfully without mesh removal and three seromas developed. Till the end of the study no hematoma, chronic pain, or recurrence has been reported [47].

In a chronic incisional hernia repair rat model study, Culbertson and his colleagues reported that, “Mesh herniorrhaphy more completely

reverses atrophic abdominal wall changes than primary herniorrhaphy, despite failing to restore normal anatomic muscle position. Techniques for hernia repair and mesh design should take into account abdominal wall muscle length and tension relationships and total abdominal wall compliance" [48].

In a most recent study on Predictors of recurrence of umbilical hernias following primary tissue repair in obese veterans by Yao JJ and colleagues from the University of Texas [49], in total of 199 patients who underwent primary tissue umbilical hernia repair, after an average follow-up 3.9 ± 2.4 years (range: 30 days - 9.2 years). They noticed 8 recurrences (4.0%) There were no recurrences among normal BMI patients (0/11), 3 in overweight (3/54) group, 2 in class I obese (2/73), 2 in class II obese (2/47), and 1 in morbidly obese (1/14) patients (P = 0.84). Recurrence rates among obese and nonobese patients were not significantly different (3.7% vs 4.6%, P = 0.72). There were 18 (9.0%) complications. BMI has no association with any of the complications. They concluded that for umbilical hernia repair even in obese patient, primary tissue repair is a still a feasible approach [49].

Some studies which have reported lower recurrence figures are likely due to underestimation or failure to adopt long term follow up [50]. Though there was not much difference in scar quality or scar pain

between mesh and suture repair. With mesh repair (in up to 50% of cases) anterior abdominal wall mobility will be reduced and it was reported as a significant drawback of this surgery.

Asolati et al concluded in their study, "Smoking, obesity, size of hernia, type of repair, or chronic obstructive pulmonary disease does not seem to predict recurrence of hernias in their VA population. African Americans, patients with type II diabetes, hyperlipidemia, and positive for human immunodeficiency virus, may have a higher risk for recurrence after elective umbilical hernia repair" [51]. The factors that cause poor wound healing and/or tissue ischemia are obesity [52], diabetes [51] and smoking [53]. In farrow et al study, the rate of hernia recurrence was not increased by obesity (BMI>30), by diabetes, or by smoking; however, the low number of recurrences may have contributed to the lack of statistical significance [27].

As 20% of the patients with ascites have Umbilical hernias. For the treatment of ascites, transvenous intrahepatic portosystemic shunt procedures can be used, these procedures has got lesser complications than peritoneovenous shunting but are more prone for occlusion. It has been shown up to 80% to 90% improvement or control of symptoms of ascites in patients for the short term. After the surgery, recurrence of ascites is related directly to the recurrence of the hernia. Large defects

should be repaired with a prosthesis and use of antibiotic prophylaxis even in ascites patients. Joaquin Rodriguez says," In contaminated wounds where bowel strangulation and resection is required, the use of absorbable mesh may avoid bowel fistulas or chronic mesh infection, but it will result in a recurrent hernia" [12]. An innovative approach of using porcine small intestinal submucosa mesh has been tried. Surgisis (Cook Surgical, Bloomington, IN) are an easily absorbable naturally available extracellular matrix. Its degradation is associated with abundant new vessel growth and remodelling of the tissue with the strength that exceeds that of the native tissue. In a preliminary report of 25 patients at a mean follow-up of 15 months, implantation of the Surgisis mesh in infected fields was associated with only one wound infection (complicated by an enterocutaneous fistula).

In a study in Rotterdam (IKAZIA hospital) a retrospective analysis of 110 patients, Suture repair was shown to have a recurrence rate of 14% (n=98) after a mean follow up of 32 months. No recurrences were seen in patients with mesh repair (n=12) [6].

Further risk factors of incisional of hernia which were identified by many authors have been divided by Yahchouchy and colleagues into major and minor in the following table [54].

Major factors	Minor factors
Chronic lung disease	Age
Obesity	Male gender
Steroids	Post-operative ventilation
Type II diabetes mellitus	Renal failure
Malnutrition	Connective tissue disorders
Jaundice	Malignancy
Radiotherapy	Transfusion
Chemotherapy	Anaemia
Oral anticoagulants	

Patient-related risk factors for incisional hernia

The risk factors mentioned above are also of influence in the development of the umbilical hernias, but there is insufficient evidence to suggest that same except for obesity and hernia size [(54)].

Complications

Early post-operative complications are defined as complications occurring within 30 days postoperatively or before discharge (if longer than 30 days). The EuraHS database will use the Clavien- Dindo classification for grading the severity of post-operative complications as shown in the below table [(55)].

Grade 0

No complications

Grade I

Any deviation from the normal post-operative course without the need for pharmacological treatment or surgical, endoscopic and radiological interventions (are allowed: antiemetica, antipyretica, analgetics, diuretics, electrolytes and physiotherapy. This grade includes wound infections opened at the bedside and

a seroma requiring aspiration bedside)

Grade II

Requiring pharmacological treatment with drugs other than such allowed for grade I complications. Blood transfusion and TPN are included.

Grade III

Requiring surgical, endoscopic and radiological interventions

IIIa Intervention not under general anaesthesia

IIIb Intervention under general anaesthesia

Grade IV

Life threatening complication requiring IC/ICU management

IVa Single organ dysfunction

IVb Multiorgan dysfunction

Grade V

Death of the patient

Late post-operative complications are defined as “complications related to the hernia repair occurring after discharge of the patient and more than 30 days postoperatively”. A recurrent abdominal wall hernia is a late negative event and it is reported as a separate outcome measurement. A hernia recurrence is defined as follows “A protrusion of the contents of the abdominal cavity or preperitoneal fat through a defect in the abdominal wall at the site of a previous repair of an abdominal wall hernia”.

Classification of post-operative seroma after ventral hernia repair [56].

Type of seroma	Definition	Clinical significance
0	No clinical seroma	No clinical seroma
I	Clinical seroma lasting<1 month	Incident
II III	Clinical seroma lasting > 1 month Symptomatic seroma that may need medical treatment: minor seroma-related complications	Complications
IV	Seroma that need to be treated: major seroma-related complications	

Clinical seroma: Those seromas detected during physical examination of patients which do not cause any problem, or just a minimum discomfort that allows normal activity.

Minor complication: Important discomfort which does not allow normal activity to the patient, pain, superficial infection with cellulitis, aesthetic complaints of the patient due to seroma or seroma lasting more than 6 months

Major complication: Infection, recurrence, mesh rejection or need to be punctured [56].

Post-operative bulging is another difficult issue which is called pseudo-recurrence [57]. If a surgical correction performed, for such bulging because of cosmetic or symptomatic reasons, it will be considered a late complication.

Chronic post-operative pain is defined as pain present more than 3 months after surgery [58]. Cunningham et al. has previously published a verbal rating scale and classification of chronic pain previously and will be used even in the EuraHS database [59]. Four grades are defined as follows: no pain, mild pain, moderate pain and severe pain.

Classification of chronic post-operative pain persisting 3 months after surgery

Pain class	Definition
No pain	No discomfort experienced
Mild pain	Was defined to the patient as an occasional pain or discomfort that did not limit activity, with a return to prehernia lifestyle
Moderate pain	Was defined as pain preventing return to normal preoperative activities (i.e. inability to continue with prehernia activities such as golf, tennis and other sports, and inability to lift objects, without pain, that patient had been lifting before the hernia occurrence)
Severe pain	Pain that incapacitated the patient at frequent intervals or interfered with activities of daily living (i.e. pain constantly present or intermittently present but so severe as to impair normal activities, such as walking)

In an another prospective single centre study it was noted that, Within days after surgery the overall complication rate was 29% , which includes superficial wound infection (11.3%), chest infection (4.8%), seroma formation (8%), wound hematoma (3.2%) and deep vein

thrombosis with a non-fatal pulmonary embolism in 1.6%. The Average hospital stay ranged from 2 to 17 days (mean 4, SD 3.78). The median follow up period for the study was 28 months of which the shortest being 12 months during which they reported 9 recurrences (>14.5%) [14].

Infection:

Interestingly, the infection rate in umbilical hernia repair appears to be much higher than that seen in other abdominal wall hernia repair despite the use of similar mesh.

For example, the rate of infection in umbilical hernia repairs with mesh has been reported as 9.5 % [40, 60] compared with up to 3% for inguinal hernia mesh repairs [61]. Importantly, postsurgical infection after abdominal wall hernia repair may predispose patients to recurrence caused by disturbances of normal wound healing.

Nieuwenhuizen et al study showed that patients with umbilical hernia had significantly higher rate (P = 0.01) of wound infections [33]. The same study showed significantly higher rate (P= 0.015) of wound infection in patients who underwent bowel resection and logistic regression analysis also showed similar significant association (P = 0.020). But Nieuwenhuizen et al concludes that mesh can be safely used in all the incarcinated hernias [33].

With the increased use of synthetically made mesh during the repair of abdominal wall hernias, the problem of SSI (surgical site infection) is more and the successful eradication of the infection commonly requires mesh removal. Mesh removal usually leaves the patient with his or her previous hernia plus the added morbidity of an operation additionally. One retrospective study of umbilical hernia repairs cited an 11.5% infection rate; however, the definition of infection was not precisely stated in the same study and a thorough investigation of factors that contributed to the rate of infection was not a part of their study [(62)].

In Ferrow et al study, culture results were available for 9 of the patients with SSIs; when a causative organism was identified, 6 of 9 (66%) were MRSA (methicillin-resistant *Staphylococcus aureus)* [(27)]. In the multiple logistic regression model, use of mesh was a significant and independent predictor of surgical site infection (odds ratio 2.45, 95% CI 1.05 to 5.71, *P* =0.039) as was ASA classification (odds ratio 2.23, 95% confidence interval 1.06 to 4.70, *P* _ .035). No other variables were significantly associated with SSI. Only 10% (3) of the SSIs necessitated surgical drainage, and 2 (6.7%) other SSIs involved the deep fascial layers of the wound, which required debridement and removal of the mesh to control the source. These latter patients underwent immediate repair using acellular dermal matrix. An explanation for this high infection rate in this present study is that the patient population was

typically older with higher number of co-morbid conditions. For example, 56% of the patients were belong to ASA class 3 or 4 when compared to only 13.5% in a large prospective study of umbilical hernia repairs, which reported a 2.5% infection rate [27].

There are many reasons for the high rate of SSI incidence in umbilical hernia repair compared to other abdominal wall hernias. Vascular supply for the umbilicus is less compared to the groin limiting the immune system of the body to access the area, prolonging the wound healing process, and inhibiting the delivery of antibiotics which are given prophylactically. This may be further exacerbated when the umbilical skin flap is excessively undermined and becomes necrotic. In addition, the umbilicus may harbour a large number of bacteria, providing a source of pathogenic organisms directly adjacent to the surgical wound [63]. This theory is supported by the evidence - MRSA was found in most infections in the study, colonizes the umbilicus almost often as the nares [64]. Large prospective randomized control studies have failed to show a statistically significant reduction in the incidence of SSI with antibiotic prophylaxis in inguinal hernia repair probably because the overall incidence of infection is low [65]. With a higher rate of infection, as seen in Farrow et al study, the potential benefit of prophylaxis dramatically increases. Thus in preventing infection after umbilical hernia repair, preoperative administration of antibiotics is effective. In the last 3 years of that study,

during this period administration of prophylactic antibiotics was accurately determined, 87% of the cases received cefazolin preoperatively. Although the groups were small, antibiotic use did not appear to decrease the incidence of infection, probably because the prophylactic antibiotics were not efficacious against MRSA [27].

During repair with gangrenous strangulated intestines, many surgeons hesitate to use mesh because of potential risk of infection. Abd Ellatif et al. [66] divided patients with incarcerated hernia into two groups: those who underwent mesh hernioplasty with resection and anastomosis, and those who did not; there was no significant difference between these two groups in terms of wound infection and recurrence rates, and no patients had to undergo reoperation to remove the mesh. Considering Takaaki et al study, it can be suggested to use the mesh even in laparoscopic strangulated umbilical hernia repair [67]. But still, late onset of mesh infection should be considered when using this composite expanded polytetrafluoroethylene mesh. To reduce this post operative wound infection risk, antimicrobial meshes have been adopted during laparoscopic hernia repair.

MATERIALS AND METHODS

MATERIALS AND METHODS

STUDY DESIGN:

This is a single centre, prospective, observational study.

STUDY PLACE:

Institute of General Surgery, Rajiv Gandhi Government General Hospital, Chennai

STUDY PERIOD: Period spanning from Feb 2017 to Sep 2017.

STUDY DESIGN: Observational study(Prospective)

SAMPLE SIZE: 50 patients.

All patients admitted in Rajiv Government General Hospital for the surgical management of paraumbilical hernia over the study period, satisfying the inclusion/exclusion criteria given were included in the study.

INCLUSION CRITERIA:

- All patients diagnosed with paraumbilical hernia and its related complications for surgical management were included in the study.
- Age >18 years
- All patients who gave consent for the study.

EXCLUSION CRITERIA:

- All incisional hernias occurring around the umbilicus.
- Umbilical hernioplasty performed incidentally during other laparotomy procedures.
- Recurrent umbilical hernias

ETHICAL CONSIDERATIONS:

Ethical Committee reviewed this study protocol and ethical clearance was obtained. Informed written consent was obtained from all the study participants after thoroughly explaining the study protocol, benefits and risks. Confidentiality of the study participants was maintained throughout the study.

METHODOLOGY:

All patients undergoing paraumbilical hernia repair at Rajiv Gandhi Government General hospital who satisfied inclusion were included in this study. Data concerning patient identifier, complete history, Clinical examination, laboratory investigations including T3, T4, TSH levels were collected as per proforma and analysed for significant correlation. All the patients were followed up through telephone enquiry every three months till the end of the study period.

Clinical parameters:

- Age-.
- Gender
- Duration of symptoms like abdominal pain, and vomiting, H/o chronic cough yes / no, if history of chronic cough was present, it was graded as mild, moderate and severe
- History of predisposing factors like asthma/COPD, chronic cough, History of Constipation, prostatism in males or obstructive urinary symptoms in females and history of hypothyroidism (including the newly diagnosed hypothyroids) are taken in detail and analysed.
- H/o Asthma yes / no, if present it is graded according severity.

CLASSIFICATION OF ASTHMA SEVERITY				
	Severity Prior to Initiation of Therapy			
	Mild Intermittent	Mild Persistent	Moderate Persistent	Severe Persistent
Symptoms	< or = 2 per week	> 2 per week	daily symptoms	continual symptoms
Nighttime symptoms	< or = 2 per month	> 2 per month	> 1 per week	Frequent
Lung function FEV1 or PEFR	> or = 80% predicted	< or = 80% predicted	> 60% - < or = 80%	< or = 60%
Peak flow variability	< 20%	20-30%	> 30%	> 30%

- H/o COPD , present or not

If present, it is graded according to MRC dyspnoea scale Grade Degree of breathlessness related to activities

1 Not troubled by breathlessness except on strenuous exercise

2 Short of breath when hurrying or walking up a slight hill

3 Walks slower than contemporaries on level ground because of breathlessness, or has to stop for breath when walking at own pace

4 Stops for breath after walking about 100 metres or after a few minutes on level ground

- Too breathless to leave the house or breathless when dressing or undressing
- H/o Constipation present or absent.
- Symptoms of prostatism in males and history of obstructive urinary symptoms in females were noted.
- H/o hypothyroidism present or absent. If the patient is a known case of hypothyroidism and on thyroid hormone replacement therapy, the dose of thyroxine is also noted.

History of chronic cough/asthama/COPD, History of Constipation, prostatism in males or obstructive urinary symptoms in females and history of hypothyroidism (including the newly diagnosed hypothyroids) are all added into one group as predisposing factors for statistical

analysis. Presence any one of the factors or more is taken as predisposing factor.

- History of any surgery in general and history of abdominal surgery in particular are noted.
- Family histories of the umbilical hernia in particular and family history of any abdominal hernia in general are taken.
- BMI- taken as a continuous variable and then later grouped as normal (<25kg/m^2), over weight (25-30kg/m^2) and obese (>30kg/m^2)
- Size of the hernia and size of the defect in cm (if it can be measured).

  This size was correlating with the intra-operative finding size.

  Size more than or less than 3 cm or more 3 cm than are taken as two groups for statistical analysis.
- Reducible or irreducible are noted.
- Tenderness - present or absent are noted
- Ascitis, present or absent are noted. If present, it is clinically graded as following ,

1+ is minimal and barely detectable

2+ is moderate,

3+ is massive but not tense, and

4+ is massive and tense.

- **Laboratory parameters:** Routine haematological investigations including the Total leucocyte count, ESR and special investigations (with special reference to Thyroid profile) are done. Thyroid hormones T3, T4 and TSH were noted and grouped into normal and hypothyroidism group. These incidentally detected hypothyroid patients were added to the other known cases of hypothyroidism group who were already on thyroid replacement therapy.

  This group of hypothyroidism is taken as one of the predisposing factor for umbilical hernia.

Imaging parameters:

Many of our patients underwent USG abdomen and/or CT scan abdomen as advised by the treating surgeon or the physician. The radiological findings of size of the hernia, defect size and the content were noted.

Surgery:

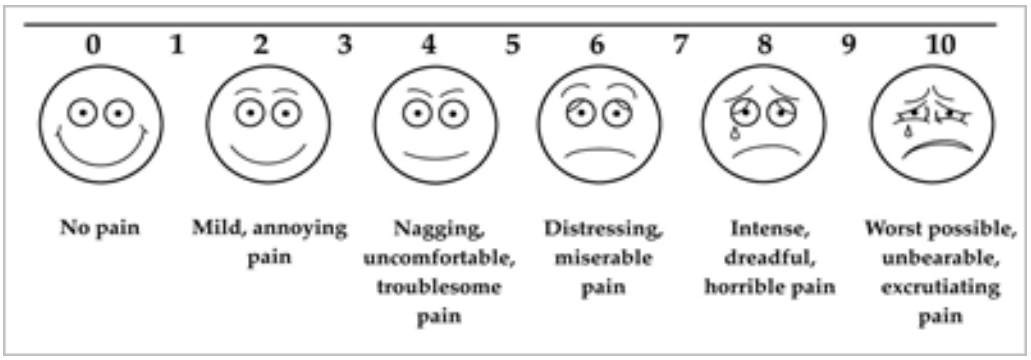
All 50 patients were taken up for surgery. Routine pre-op investigations are done as required. The type of anaesthesia is decided by the anaesthetist and operating surgeon. Out of the total 50 cases 44 were taken up for surgery electively and 6 cases were taken for emergency surgery. Type of the incision, infraumbilical or tranverse is surgeon's choice and beyond scope of our study. Most of the surgeons in our hospital would prefer subumbilical smiley incision, if there is no definitive indication for midline laparotomy. Wound deepened through the subcutaneous tissue and the hernia sac is dissected from the surrounding structures all around.

Sac opened after lifting up a part of it with 2 straight artery forceps, and the contents of the sac are visualised. The contents of the sac are noted down and grouped into empty sac, only omentum and small or large bowel loops with or without omentum. Once it is confirmed that contents of the sac are viable, contents are reduced into the peritoneum. If the part of the bowel is not viable, resection of the segment and anastomosis of the two cut ends are done. The rectal sheath is closed in layers using synthetic nonabsorbable sutures like ethilon or prolene or delayed absorbable sutures like PDS according to the operating surgeons preference. After the closure of the rectus sheath, in one group (MESH

REPAIR) of patients on-lay prolene mesh is placed and fixed with prolene sutures and in the other group **(**ANATOMICAL REPAIR) only the rectus sheath closure was done without placing any mesh. Suction drain is placed without in selected number of cases. Depending on the drain, cases are grouped in to DRAIN and NO DRAIN group and analysed statistically.

Immediate post operative period:

Post operatively the patients were given adequate analgesia and antibiotics as per the anaesthetist or the surgeon's preference and that is beyond scope of this study. Post operative pain is recorded for the first three days by visual analogue pain scale. Pain is recorded before giving the analgesics.



All the cases in the study population had severity of the pain less than 6 and later for statistical analysis, this pain is graded into no pain (score 0), mild (score 2) and moderate pain (score 4). Those patients who

were discharged from the hospital were called over telephone and the pain score was recorded. All the 50 cases were monitored for any immediate complications like seroma, hematoma or wound infections and delayed post op complications like seroma, mesh infection, chronic pain and recurrence. Since the practice of keeping the drain in majority of the mesh repairs and even in anatomical repairs, the number seroma collections were less in our study than the previous literature. Other than the seroma collection, post operative complications we come across in our study are post op MI and Pneumonia, post op confusion, delayed GI recovery, immediate post op restlessness, acute asthma, recurrent wound infection and mesh removal. Since the number of cases with each of these complications were less, all these complications were grouped into single group POST-OP COMPLICATIONS and analysed.

Follow up:

Date of surgery is noted in all the cases and post op follow up is calculated as the number of days of follow up from the date of surgery. Every one month all the patients were called over phone and enquired. Any complaint of post operative pain, swelling or collection is asked. If the patient is having pain it is graded in to mild, moderate and severe. History of recurrence of similar hernia at umbilicus is asked. If recurred, duration of the recurrence from the date of surgery, mode of onset and the

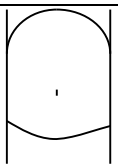
risk factors are asked and noted. The patient is asked to review back to hospital and the recurrence is confirmed after through physical examination:

Telephone enquiry form:

QUESTIONNAIRE 1

Recurrence	Have you noticed recurrence of your umbilical hernia, after the operation	Yes No In doubt
Pain	Have you had any pain, within the last month, in the area where the umbilical hernia was situated before the operation	Yes No If the answer was yes, a more detailed questionnaire was asked
Consequence of pain	If you had any pain in the groin area within the last month, have you been examined or treated for this pain If you have had any pain in the groin area within the last month, has this pain been the cause of limitation in work or leisure activities	Yes No Yes No

QUESTIONNAIRE 2

Localisation of the pain	On the drawing, please mark the area, where the pain typically is situated	
Impairment, as a consequence of pain	Please state whether the pain in the groin is a problem carrying out the following activities: Raising from low chair Sitting down >30 min Standing up >30 min Walking on stairs Shopping Driving a car Travelling by bus or train Exercising usual sport activities Don't know	Yes No Don't know Not applicable
Description of pain	Please mark any of the following words, that best describes the pain in the groin: Tender Shooting Pricking Constricting Sharp/cutting Cleaving Pulling Drilling Hot/burning Dull/aching	

	Radiating Pounding/hammering Irritating Tiring/exhausting Sickening Frightful Punishing	
Frequency of pain	How often is pain present	Seldom Occasionally Always or nearly always
Level of pain	How strong is the pain typically - At rest - During physical activity	No pain Slight pain Moderate pain Severe pain

The total duration of follow up is calculated from the date of surgery and calculated in number of days. The range and mean of all the 50 cases are taken for the statistical analysis.

STATISTICAL ANALYSIS:

IBM SPSS statistical software version 21 was used for statistical analysis. Descriptive analysis of all the independent and dependent variables were done. All the parameters were described as categorical variables and were presented in frequencies and percentages. Difference in distribution was calculated using the Chi-Square test and Fisher's Exact Test depending on the number of cases in each subgroup. P value <0.005 is taken as significant. Graphical representation of analysis is also presented in an appropriate way.

RESULTS

RESULTS AND ANALYSIS

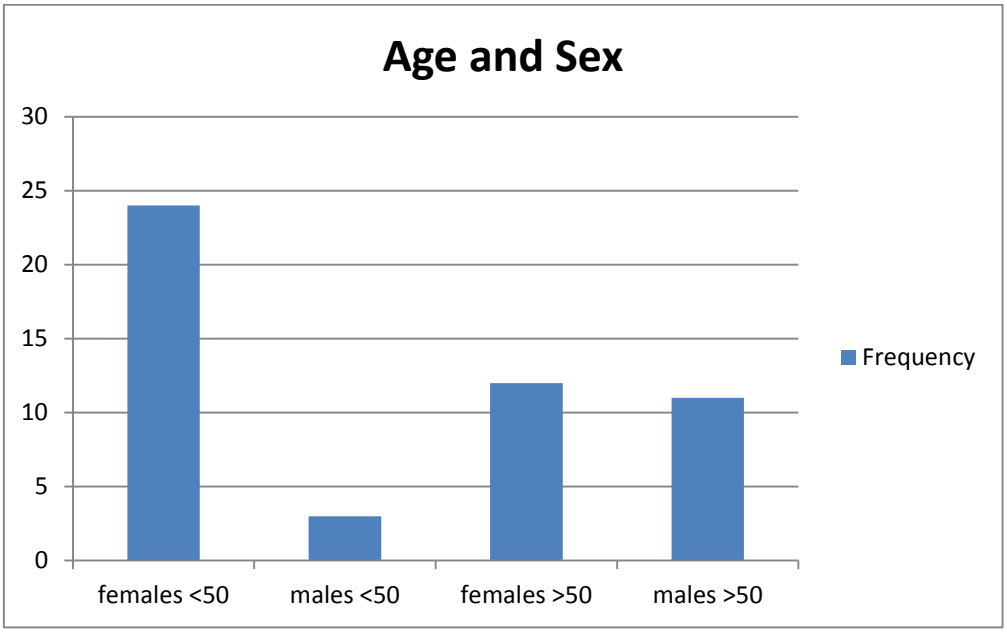
Descriptive tables

Section 1. Demography

Table 1

a) Age <50 years >50 years	 27 23	 54% 46%	 P=0.572
b) Sex Females Males	 36 14	 72% 28%	 P=0.002
c)Sex and Age females <50 males <50 females >50 males >50	 24 3 12 11	 66.7% 21.4% 33.3% 76.6%	 P=0.005
d)Parity Parous Nulli parous	 32 4	 88.9% 11.1%	 P<0.001
e)Age group	Female		Male
30-39 years	17		1
40-49 years	6		2
50-59 years	2		4
>60 years	11		7
Total	36		14

Chart 1.



In this table and chart showing distribution of patients into a)age <50 and >50, b) sex, c)age and sex d) parity in female cases, among 50 recruits, 27 cases (54%) were belong to age < 50 years, 23 cases (46%) were of age group > 50 years (P=0.572). 36 were females and 14 male (P=0.002). In the total 50, 27 were less than 50 years of age majority were females, 24 out of 27 (88.9%) were females, and 3(11.1%) were males and 23 were aged more than 50 years, including 12(52.2%) females and 11(47.8%).

Table 1e) is showing the number of males and females with regard to the age group. It can be observed that incidence in females has a bimodal peak one is 30-39 years and the other is > 60 years but in males incidence is gradually increasing with age.

Table 2

a)Predisposing conditions	Female	Male
Chronic cough	1	0
Asthma / COPD	6	2
Constipation	1	3
Urinary symptoms	1	5
Hypothyroidism	8	1

In the above table showing the predisposing factors and their sex distribution, hypothyroidism is seen predominantly in females (8/9). Constipation and obstructive urinary symptoms are seen predominantly in males (3/14 and 5/15 respectively).

b)Predisposing factors	Present		Absent		P value
	Frequency	Percentage	Frequency	Percentage	
Total	20	40%	30	60%	0.522
Females	14	38.9%	22	61.1%	
Males	6	42.9%	8	57.1%	

In this table showing predisposing factors and sex distribution, at least one of the predisposing factors for the umbilical hernia was present 20(40%) out of the 50 patients. Among them 14 were females and 6 were

males. Predisposing factors include history of chronic cough, asthma /COPD, Constipation, prostatism in case of male patients and obstructive urinary symptoms in females and Hypothyroidism or on treatment for Hypothyroidism.

Table 3

Co-morbidities	Present		Absent		P value
	Frequency	Percentage	Frequency	Percentage	
Total	27	54%	23	46%	0.109
Females	17	47.2%	19	52.8%	
Males	10	71.4%	4	28.6%	

In the above table, this shows co-morbidities and sex distribution. Co morbidities were present in 54% (27/50), in males its 71.4% (10/14), in females it is 47.2% (17/36). It means the co-morbidities were more common in male patients. Co morbidities include coronary artery disease, hypertension and diabetes mellitus.

Table 4

DM	Present		Absent		P value
	Frequency	Percentage	Frequency	Percentage	
Total	15	30%	35	70%	0.185
Females	9	25.0%	27	75.0%	
Males	6	42.9%	8	57.1%	

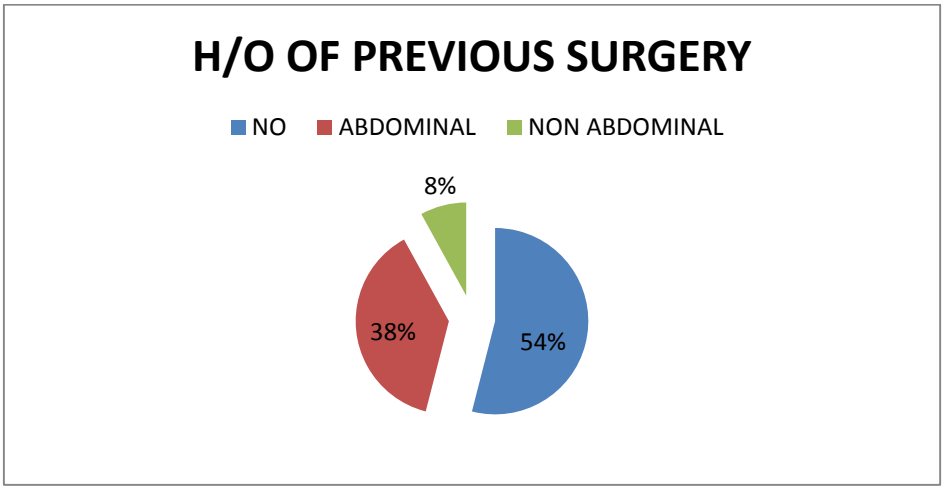
This table showing the diabetes and sex distribution, Diabetes was present in 30 % (15/50), in males 42.9% (6/14), in females it is 25% (17/36). This shows that diabetes is slightly on higher side in male patients.

Table 5

History of Previous Surgery

History of Previous Surgery	Frequency	Percent
No	27	54.0
Abdominal	19	38.0
Non- Abdominal	4	8.0
Total	50	100.0

Chart 2.



This is the table and chart showing previous history of surgery. Previous history of laparotomy was present in 19/50(38%). 4 pts underwent Non- abdominal surgery previously.

Table 6

a) BMI and gender

BMI	Normal		Over weight		Obese	
	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage
Total	7	14%	21	42%	22	44%
Females	5	13.9%	14	38.9%	17	47.2%
Males	2	14.3%	7	50%	5	35.7%

This is the table showing BMI and sex. Only 7 patients were having normal BMI (<24.9kg/m2), among these only 2(14.3%) were males and 5(13.9%) were females. Among the 21 over weight (who had their BMI more than 25kg/m2 but less than 30kg/m2), 14(38.9%) were females and 7(50%) were males and among the 22 obese (who had their BMI more than 30kg/m2), 17(47.2%) were females and 5 (35.7%) were males. (P=0.741).

b) BMI and age

BMI	Normal		Over weight		Obese	
	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage
Total	7	14%	21	42%	22	44%
Age <50	4/27	14.8%	10/27	37.0%	13/27	48.1%
Age >50	3/23	13.0%	11/23	47.8%	9/23	39.1%

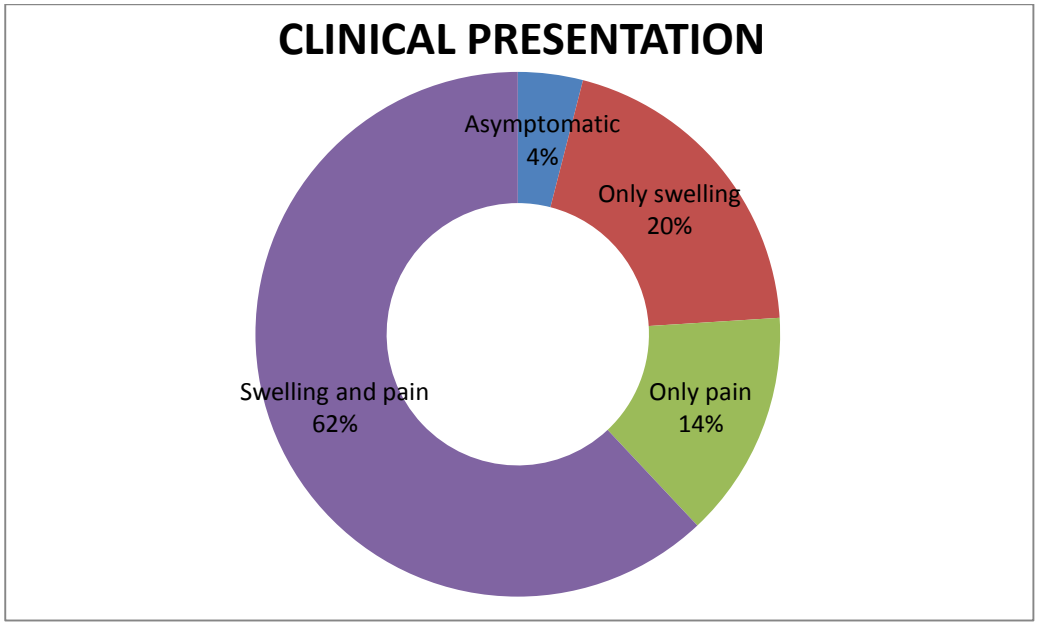
This is the table showing BMI and age 7 of the 50(14%) patients were having BMI < 24.9kg/m2 and taken as normal and Among the 21 over weight (who had their BMI more than 25kg/m2 but less than 30kg/m2), 10(37.0%) were < 50 years and 11 (47.8%) were > 50 years and among the 22 obese (who had their BMI more than 30kg/m2), 13 (48.1%) were < 50 years and 9 (39.1%) were >50 years. (P=0.740).

Table 7

Clinical presentation:

Clinical presentation	Frequency	Percent
Asymptomatic	2	4%
Swelling	10	20%
Pain	7	14%
Swelling and pain	31	62%
Total	50	100%

Chart 3.



This is the table and chart showing the presenting symptoms and their percentage. Swelling was present in 82 %(41/50) and absent in 18% (9/50). Pain was present in 76 %(38/50) and absent in 24 % (12/50). 7/50 (14%) pts had only pain and 10/5 (20%) pts had only swelling as the presenting symptom.

Table 8

Clinical examination:

a) Tenderness:

Tenderness	Present		Absent		P value
	Frequency	Percentage	Frequency	Percentage	
Total	21/50	42%	29/50	58%	0.593
Females	15/36	41.7%	21/36	58.3%	
Males	6/14	42.9%%	8/14	57.1%	

In this table showing the presence or absence of tenderness in males and females, 21/50 (42%) pts had tenderness, out of them 15/36(41.9%) were females pts and 6/16(42.9%) were male pts.

b) Reducibility

Reducibility	Reducible		irreducible		P value
	Frequency	Percentage	Frequency	Percentage	
Total	37/50	74%	13/50	26%	0.529
Females	27/36	75%	9/36	25%	
Males	10/14	71.4%	4/14	28.6%%	

In this table showing the reducible or irreducible hernia in males and females, 9/36(25%) female pts and 4/14(28.6%) male pts had irreducible hernia.

c) Size of the hernia

Size of the hernia	<3cms		>3cms		P value
	Frequency	Percentage	Frequency	Percentage	
Total	20/50	40%	30/50	60%	P=0.368
Females	13/36	36.1%	23/36	63.9%	
Males	7/14	50%	7/14	50%	

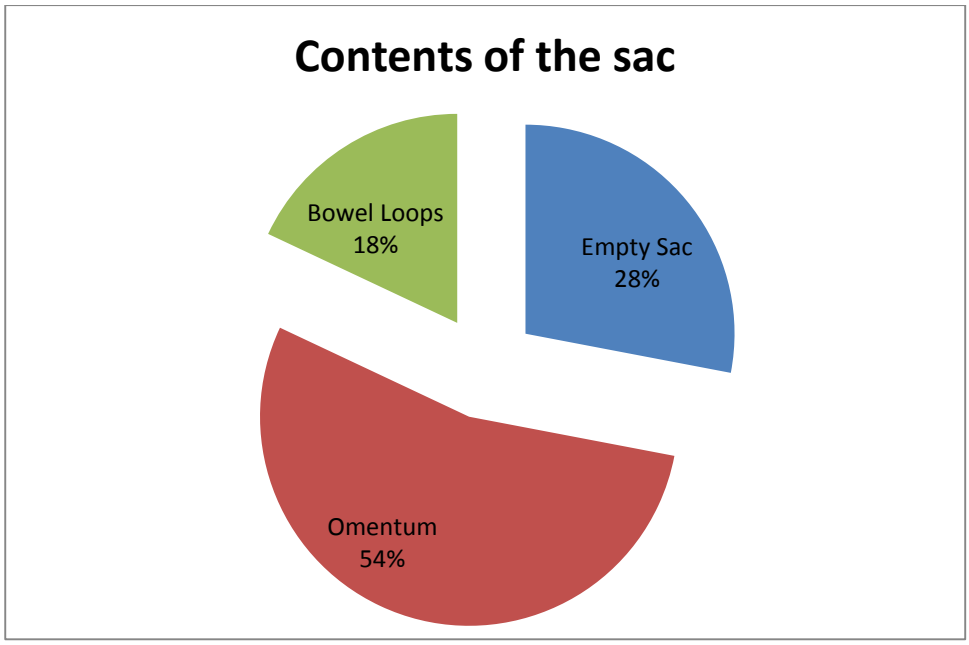
In this table showing the size of hernia and sex distribution, out of the total 50 cases, 20 patients had hernia size less than 3 cm and including 13 (36.1%) females and 7(50%) males. In the 30 patients of > 3cms hernia size 7(50%) were males and 23(63.9%) were females. More females have hernia size more than 3cm but in males it is equally distributed. (Hernia size ranged from 1.5 to 11 cm)

Table 9.

a) Contents

Contents	Frequency	Percentage
Empty Sac	14	28%
Omentum	27	54%
Bowel Loops	9	18%
Total	50	100%

Chart 4.



In the above table and chart showing the contents of the sac and their percentage, (28%) patients had empty sac, omentum was the only content in 27(54%) and small or large bowel loop were present in 9 cases (18%).

b) Irreducible hernia: contents and size.

Irreducible hernia	Frequency	Percentage
Content :		
omentum	6/13	46.2%
bowel	7/13	53.5%
Size:		
<3 cm	2	15.4%
>3 cm	11	84.6%

In this table showing the irreducible hernias and their relation to the contents and the size. In 13 irreducible hernias, 6(46. 2%) had omentum as their content and 7(53.5%) had bowel, 11(84.6%) hernias were >3 cm in their size and 2 (15.4%) were <3cm in size. The chances of irreducibility are high when bowel is a content of the hernia sac.

Table 10.

Surgery	Frequency (percentage)
Type of surgery : Elective emergency	 44/50 (88%) 6/50 (12%)
Type of Repair: Mesh Anatomical	 35 (70%) 15 (30%)
Drain No drain	38 (76%) 12 (24%)

Surgery done in all the 50 cases. In the above table, showing the type of surgery, type of repair used and the use of drainage tube. Majority underwent elective repair 44(88%) and mesh placed in 35(70%) cases and drain placed in 38(76%). 6 cases (12%) were taken up for emergency surgery, 15 (30%) cases were anatomically repaired and no drain is used in 12 (24%). 6 patients were taken up for emergency surgery because of presentation with deteriorating general condition or no improvement with the initial conservative management.

Table 11.

	Elective	Emergency	P value
Anatomical	10/15 (66.7%)	5/15(33.3%)	P=0.007
Mesh	34/44(77.3%)	1/6(16.7%)	

In the above table showing the type of surgery and type of repair used, among the 50 cases, 44 cases underwent elective surgery and 6 cases were taken up for emergency surgery. Mesh was placed in 34 (77.3%) of 44 elective cases and 1(16.7%) of 6 emergency cases. Among 15 cases who underwent anatomical repair, 10 (66.7%) were Elective and 5 (33.3%) were emergency. (P=0.007)

Table 12.Mesh and drain

	Drain	No drain	P value
Anatomical	7/15 (46.7%)	8/15(53.3%)	P=0.003
Mesh	31/35(88.6%)	4/35(11.4%)	

In the above table, among the 50 cases, 15 and 35 underwent anatomical and mesh repair respectively. In anatomical repair, drain was placed in 7(46.7%) and in mesh group drain was placed in 31(88.6%). (P=0.003)

Table 13.

Elective/ emergency and drain

	Drain	No drain	P value
Elective	33/44 (75%)	11/44(25%)	P=0.553
Emergency	5/6(83.6%)	1/6(16.7%)	

Among the 50 cases, 44 cases underwent elective surgery and 6 cases were taken up for emergency surgery. 33 in 44 patients (75%) elective and 5/6 (88.6%) patients in emergency surgery had drain. It shows drain is placed in the majority of the patients irrespective of the Elective or emergency surgery group. (P=0.553)

Table 14.

a) Complicated hernia

Complications	Present	Absent	P value
Elective	6/44 (13.6%)	38/44(86.4%)	P=<0.001
Emergency	6/6(100%)	0/6(0%)	
Hernia size <3cm	1(5%)	19(50%)	P=0.010
>3cm	11(95%)	19(50%)	
Reducibility: Reducible	1(2.7%)	36(97.3%)	
Irreducible	11(84.6%)	2(15.4%)	P=<0.001

In the above table, 12 complicated cases (incarceration, obstruction or strangulation) of 50 recruits are analysed with type of the surgery, size of the hernia and reducibility. All 6(100%) emergency cases were complicated but only 6(13.6%) out of 44 elective cases were complicated (P=0.000). 11(95%) complicated were having the size more than 3 cm but only 1(5%) out of the 12 had size less than 3cm (P=0.010). 11(84.6%) of the 12 complicated hernias were irreducible but only 1/12(2.7%) was reducible (P=0.000). This shows the strong statistically significant association between the size of the hernia, emergency surgery and reducibility.

b) Symptoms of complicated hernia

Symptoms	Uncomplicated hernia (percentage)	Complicated hernia (percentage)	Total
Asymptomatic	2 (5.3%)	0 (0%)	2
Pain	6 (15.8%)	1(8.3%)	7
Swelling	30 (78.9%)	11 (91.7%)	41
Total	38	12	50

In the above table showing the symptoms of complicated and uncomplicated cases, swelling (11/12) was the predominant symptom even in the complicated group.

c) Complicated v/s uncomplicated

		Complicated hernia	uncomplicated hernia
Type of repair	Anatomical	6	9
	Mesh	6	29
Type of surgery	Elective	6	38
	Emergency	6	0
Post op complications	Yes	3	3
	No	9	35

This is the table showing the number of cases of complicated and uncomplicated hernia with respect to type of repair, type of surgery and post operative complications. Among the 12 complicated hernia , 6 underwent anatomical repair and 6 mesh repair respectively, 6 were elective and 6 were emergency and 3 out of these 12 had post op complications.

Table 15.

Post operative complications

Number	Post operative complications
1	Immediate post op restlessness -1
2	Acute exacerbation of asthma-1
3	Seroma after 3 months: recurrent wound infection: mesh removal
4	Post op MI and Pneumonia
5	Post op confusion
6	Delayed GI recovery

This is the table showing post operative complications in 6 patients.

Section 2. Hypothyroidism

Table 16.

a)Hypothyroidism	Yes	No	Percentage among sex
Males	1	13	7.1%
Females	8	28	22.2%
Total	9	41	

In the above table, Out of theses 9 cases of hypothyroidism, 8 were females and 1 was male patient. 22.2% of the total females were hypothyroid, but only 7.1% of the male were hypothyroid. But the number is smaller for the statistical significance. Out of these 9 cases, 5 were known cases of hypothyroid on replacement therapy and 4 were newly detected during the study.

b) Hypothyroids and non-hypothyroid

	Hypothyroid	Percentage	Non-hypothyroid	Percentage
Incidence	9/50	18%	41/50	82%
Recurrence	1/9	11.1%	1/41	2.4%

In the above table showing difference between the incidence and recurrence among the hypothyroid and non-hypothyroid groups, among the 9 hypothyroid patients 1 developed recurrence.

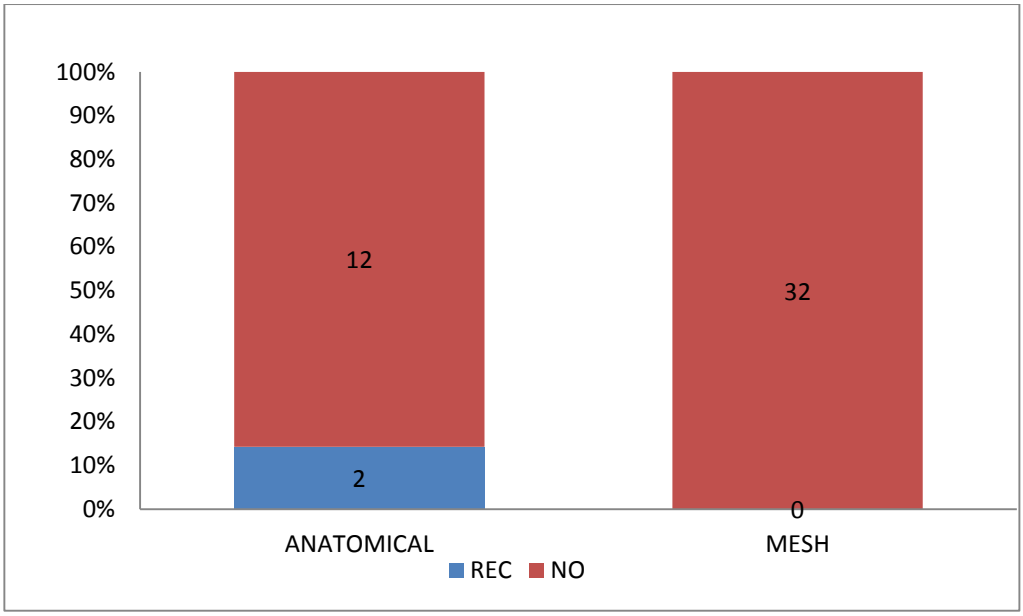
Section 3. Recurrence

Table 17.

a) Recurrence

	Recurrence	No recurrence	P value
Anatomical	2/14 (14.3%)	12/14(85.7%)	P=0.029
Mesh	0/32(0%)	32/32(100%)	

Chart 5.



This is the table and chart showing the recurrence among the anatomical and mesh repair groups, 4 patients were lost during follow up, in the total 46 patients who were followed-up to till the end of the study period, there were 2 (14.3%) recurrences one after 120 days and the other

after 180 days of surgery in the 14 patients who underwent anatomical repair and no recurrences in the mesh group. (P=0.029).

b**)** Recurrence cases-

	Sex	Age	Recurred after	Type of surgery	Type of repair	Content	Obs Sym	obesity
Recurrence 1	Female	45	120 days	Elective	Anatomical	Omentum	No	No
Recurrence 2	Male	79	180 days	Elective	Anatomical	Bowel loops	Yes	Yes

From the above table, there are two recurrences of the umbilical hernia both repaired by anatomical method without placing the mesh. One was a 45 year lady, not obese who underwent elective hernia repair and recurred after 120 days with an episode of respiratory tract infection, second case was a 79 year old male, obese who was presented with obstructive symptoms and underwent elective anatomical repair, recurred after 180 days.

DISCUSSION

DISCUSSION

Umbilical hernia – a defect in fascial plane of anterior abdominal wall at M3 plane of the Chevrel's classification- 3 cm above and below umbilicus, is a frequent clinical problem, often seen as an emergency with irreducibility and incarceration but rarely discussed in the medical literature.

The present study conducted at St. Isabel's hospital on 50 recruits undergoing surgery was analysed with regard to demography, presence of risk factors, complications, surgery with or without mesh and drain and recurrence.

The mean age in our study population consisting of 36 females and 14 males was 50.64 years (SD=15.46). Most of the married females (32/36) are multiparous (P<0.001). Among 50 patients, 24 (88.9%) females were less than 50 years but only 3(21.4%) were males less than 50 years. Whereas 11(76.6%) males and 12 (33.3%) females were in the age group of >50 years (P=0.005). Inferring that hernia were more in women of reproductive age and <50 years of age unlike men, where hernia occurs at later in age. The incidence in females has a bimodal peak one is 30-39 years and the other is > 60 years but in males incidence is gradually increasing with age (Table 1).

Linas in his study of 97 patients of umbilical hernia observed [5] more females 66/97(68%) whereas 31/97 males (32%) had umbilical hernia.

Also Arroyo reported 118/200 females and 82/200 males having umbilical hernia [32]. Joaquin [12] observed women are affected 3 to 5 times more common than men. But Muschaweck [68] described female to male ratio of 3: 4.

Emilio [31] reported equal gender description in his study of 82 patients where 40 were males and 42 were females.

It is a condition of elderly in 5^{th} and 6^{th} decade of age. As the condition is mostly acquired, mean age was 57.1 year as per Linas, 57 years as per Arroyo. Muschaweck reported mean age as 54.6 years (18-79 year) [68]. Emilio [31] reported mean age as 42.5 ± 19 years. Joaquin [12] described that women of age 35 - 40 years develops increased frequency of umbilical hernia.

As against the idea of adult umbilical hernia, this resulted from persistence of the infant hernias. It is not so, as 95% of hernia acquired due to gradual yielding of the umbilical ring due to increased intra-abdominal pressure and weekend fascial tissues. The present study has only 2 cases of hernia occurring from the childhood and the remaining all are acquired.

Intra abdominal pressure increases by severe obesity, H/o multiple pregnancies, prolonged labour in women, constipation, chronic cough, ascites, and large intra-abdominal tumours [68]. In the present study the predisposing factors which include chronic cough, asthma/ COPD, Constipation, prostatism, hypothyroidism were present in 40% of the cases (as per table 2b) with no gender difference (P= 0.522). Hypothyroidism and asthma/COPD were seen predominantly in females. Constipation and obstructive urinary symptoms were more common in males (table 2a).

Co-morbidities affect outcome of surgery and are responsible for intra-operative and post operative complications. In Muschaweck [68] study associated diseases were present in 61% of the patients, including cardiac, respiratory problems, varicose veins, metabolic syndromes and allergies. In the study of Arroyo [32], out of the 200 patients of umbilical hernia 173 were ASA grade 1 and 2, 27 were ASA grade 3.

Co-morbidities in the present study were seen in 27/50, males its 71.4% (10/14), in females it is 47.2% (17/36). It reflects that the co-morbidities were more in older age and males (Table 3).

As regards to diabetes mellitus which is of intra-operative concern and affect the management, 15/50 (30%) were diabetic with no statistical significance with regard to gender (P=0.185) as per table 4.

Family history of the hernia in first degree relatives was present in only 5 of the 50 recruits of which 4 were males and one female, though not a statistically significant finding. A national wide study conducted in Sweden by Zoller and his collegues on familial susceptibility of surgically treated abdominal wall hernias which also included 22,761 cases of umbilical hernias. They conclude that "Family history of surgically treated abdominal wall hernia is an important risk factor for surgical treatment of abdominal wall hernias. They share familial susceptibility, but site-specific familial factors might exist. Several spouse risks were increased, suggesting the possibility of a nongenetic contribution to familial risks" [(69)].

Patient with protrusion of the umbilicus from its normal position suggests umbilical hernia which can be confirmed by palpation of defect and incarcerated sac or protrusion of the sac through fascial ring on straining. In the current study, as per Table 7, 2/50 were asymptomatic detected incidentally, swelling with or without pain was present in 41/50 cases, pain with or without swelling was present in 38/50. There by inferring that both swelling and pain were conspicuously presenting findings. Only swelling was in 10/50 and only pain in 31/50. 10/50 had obstructive symptoms. Patients presenting with pain or lump at umbilicus, pain is described as dragging sensation or sharp and acute type

of pain around the umbilicus with coughing, straining and incarceration. As per the study by Joaquin 39% were asymptomatic at the time of discovery, 61% experienced pain earlier or pressure symptoms or nausea and vomiting. Pain was the most common complaint 44% followed by pressure 20% and nausea and vomiting in 9% [12].

Not all the patients had tenderness, only less than half 21/50 had tenderness though 38/50 complaints of pain. As regard to size of the hernia, <3 cm was in 20 recruits and >3cm was in 30 recruits. 14/50 had empty sac, omentum was the content in 27/50 and bowel in 9/50, as per Table 8a), 8c) and 9. In the present study, hernia was reducible in 37/50 and irreducible in 13/50. Of the irreducible, 6 had omentum as the content of sac and 7 bowel, 2 were <3cm and 11 were >3cm, as per Table 9b). Complications occurred in 12/50, which were all irreducible, containing only omentum in 4 and bowel in 8, One <3 cm and 11 were >3cm as per Table 14a).

Hernia can be quiet large with fascial defect of 10-15 cm, but most of the swellings are less than 5cm. Omentum, and bowel loops (small and large bowel) are found in hernia sac, 27/50 and 9/50 respectively were noted in the present study. Table – 9a) and Chart- 4.

Baccari described omentum alone or in combination with small or large bowel as content of hernia in 60% of patients and Small bowel and

large bowel was found in 4% and 7%, respectively [13]. These hernias prone for incarceration because of the adhesions from the omentum and bowel to the hernial sac and the relatively small size of the fascial defect compared with the large amount of sac contents. In the present study 13 were incarcerated of which 12 were complicated, presented with acute pain, nausea, vomiting and tenderness.

Emilio felt that small defects are more dangerous because of tendency to incarcerate and subsequently leads to bowel oedema. But in the present study in contrast to Emilio opinion, 11 out of 13 cases were >3 cm defects [31]. If left untreated, the frequency of intestinal obstruction is ~37.5%. Umbilical pain is the main symptom of progression to incarceration but without vascular compromise or obstruction. Features of obstruction, irreducibility and gangrene were taken as variables of complications in the present study, 6 cases were obstructed, 5 were irreducible and only 1 case was gangrenous.

Obesity is a contributing factor to the etiology of umbilical hernia which also poses problem during surgery, especially during laparoscopic repair and also known to be associated with recurrence. Association of obesity with weeping dermatitis has been described [12].

In the current study 7/50 (14%) were normal (BMI <24.925 Kg/m2), 21/50 (42%) were overweight (BMI >25 Kg/m2 to 29.9Kg/m2) and 22/50

(44%) were obese having BMI>30 Kg/m2 which are almost equal. There was no statistically significant correlation with age and gender. Table no-6a) and b).

Increasing obesity with flabbiness of the abdominal muscles is attributed as etiological factor for umbilical hernia [3]. Joaquin opined that umbilical hernia occurs frequently in obesity and repeated pregnancy [12].

Muschaweck [68] observed mean BMI as 23.4kg/m2 in females and 27.9kg/m2 in males, Linas [5] in his study of 97 patients observed umbilical hernia in obese individuals and recurrence after surgery was more in obese but Halm [40] and Arroyo [32] did not find any correlation with obesity.

Umbilical hernias will continue to enlarge if untreated and prone to incarceration and thus they should be considered for repair at the time of presentation. Spontaneous rupture of umbilical hernia can occur and becomes an emergency surgical problem. If left untreated umbilical hernia may result in complications like strangulation, incarceration or spontaneous rupture [18, 19, 20]. Development of complications is unpredictable but when these appear, a simple situation will become a difficult and urgent problem. The frequency of intestinal obstruction reported in a study is ~37.5%; hence prophylactic repair should be always done between 2 and 4 years [39] after detection.

In the current study all 50 recruits underwent surgery including 2 asymptomatic. 44/50 had elective surgery and 6/50 had emergency surgery. Though 13 were irreducible, emergency surgery was considered in 6 cases. The remaining 7 of 13 cases, presenting with acute pain in the region of the umbilicus were admitted and treated with analgesics, prepared and taken up for elective surgery.

The recent contribution to traditional/conventional primary anatomical repair is the use of prosthetic hernia mesh in the last two decades and laparoscopic techniques.

Advocates of laparoscopic hernia claims its superiority over open method as lap techniques has smaller incision, minimal tissue handling for placing larger mesh which decreases the complications and has posterior patching of fascial defect as against the mesh placed anterior to rectus in open method with low recurrence rates [12].

As per Joaquin [12] hernias >3cm in obese and recurrence hernias should have laparoscopic mesh repair where recurrence is high. But, laparoscopy is more expensive, time consuming and needs expertise. But in the present study, no laparoscopic repair was done and all were repaired by traditional open method infraumbilical smiley incision through the subcutaneous fat and exposing the rectus fascia unless midline laparomtomy is clearly indicated. Smith-Behn and Katz [28] proposed a transumbilical approach with the idea of improving the

aesthetic appearance of the umbilicus and preserving the original shape of the umbilicus and tried to avoid, total resection of the umbilicus if possible. In Mexico it has been proposed in by Vega- Rasgado[29] and Ibanez-Fuentes et al [30] as an alternative to surgical repair of umbilical hernia. Recently, a similar study in Mexico showed clearly superior cosmetic results in their patients using the transumbilical approach [31] but in the present study, umbilicus is retained in all the cases.

The purpose of the surgery is not only speedy surgical exploration and reduction of the contents in acute cases but also to prevent complications ensuring no recurrence, which varies 10-30% in literature. Size of the hernia, obesity, factors 10 out of the 15 anatomical or primary repairs without mesh were elective (66.7%) as against 5/15 (33.3%) in emergency group which increases intra-abdominal pressure and postoperative respiratory complications contribute to recurrence.

To prevent recurrence and tension free surgery, number of meshes has been introduced in the last two decades. Mesh has been used in 34 out of 44 elective cases (77.3%) and only one of the 6 (16.7%) emergency cases in the present study. There by meaning that mesh repair was more in the elective and primary repair without mesh was more in emergency surgery group (P=0.007) as per Table-11.

Mesh is not routinely used by all surgeons in the repair of acute hernias complicated with incarceration, bowel ischemia for the fear of

post operative complications especially when bowel or omentum is incarcerated in the hernial sac sometimes necessitating bowel resection. Nieuwenhuizen et al, [33] reported high wound infection rates in patients requiring intestinal resection. But still the above study suggests that the type of repair that is primary suture or mesh has no significant relation with post operative wound infection. Nieuwenhuizen et al used mesh in all 53 acute incarcerated hernias. Though wound infection relatively high, it could not be considered as contraindication for use of mesh and can be treated effectively with antibiotics and local dressings [33]. The complications and post operative infection may be due to ischemic bowel resection and not due to mesh.

Arroyo et al in his 200 patients, 100 with mesh and 100 without mesh found recurrence in 11 % of without mesh and 1% of with mesh, irrespective of the size of hernia and BMI [32].

Rodrigo [26] compared 24 patients with primary suture repair and 20 with mesh ORWM and found that the post op complications were greater ie 30% in ORWM compared to PSR 4%. They reported high wound infection and increased use of drain in ORWM. Time taken for emergency surgery was longer but complications were similar in both the groups.

It is said that the use of mesh for small hernias is more difficult, time consuming, and placement of mesh in a small (less than 2 cm's) hernia will lead to fascial defect enlargement. Legnani et al. [36] and Atila et al [35] have found that wound infections will be of low incidence of in acute hernia repaired with the use of prosthetic mesh. Abdominal wall atrophic changes can be more completely reversed by mesh herniorrhaphy than with primary herniorrhaphy, despite failing to restore normal anatomic muscle position. Techniques of hernia repair and mesh design, abdominal wall muscle length, tension relationships and total abdominal wall compliance should be taken into account [48].

In a randomised control study of 160 patients who underwent either suture repair or mesh or autodermal skin graft , Korenkov et al, reported fewer infectious complications after the suture repair (3 out of 33) than in the other group. They discontinued the trial because of the severity of the infections after polypropylene mesh implantation and they have not noticed any differences in the duration of stay in hospital and quality of life. But, after polypropylene mesh repair, pain was significantly more frequent (pooled risk ratio 2.9 and 1.8 at 6 weeks and 1 year respectively) [41].

In another similar prospective randomised control trial on comparison of prosthetic mesh repair and tissue repair in the emergency management of incarcerated para-umbilical hernia from Alexandria,

Abdel-baki reported, for emergency management of incarcerated Paraumbilical hernia, the use of prosthetic repair is safe and has superior results, in terms of recurrence, compared with conventional tissue repair. The presence of non-viable intestine is not regarded as a contraindication for prosthetic repair [44].

It is said that the Polyprolene meshes are considered ideal for use in contaminated or clean contaminated surgical fields such as incarcerated or strangulated hernias. The wide pores measuring >70 microns of these meshes allow free contact between bacteria, whose diameters measures 1 micron, and the immunes system cells (Eg. granulocytes and macrophages) which measures 15-20 microns in diameter. This explains the lower probability of infection and allowing recovery from infections even if it occurs [37, 38].

In Eryilmaz study, recurrence rate was significantly higher in the primary repair group (14%) compared with polypropylene mesh repair group (2%). In contrary to the general tendency of repairing small defects primarily, this study concluded that "polypropylene mesh should be used in all umbilical hernias regardless of the size of the defect" [45].

Amato et al did a study about the need for mesh fixation and sufficient overlap of the defect by the mesh. In this study, they described a modified technique based upon a newly developed mesh with a special

design for ventral and incision hernia repair. This implant of new type was intended not to be point-fixated. This unique geometrically shaped mesh consists of a large central body and the radiating arms, which are used to repair ventral or incisional hernia. It allows broader coverage of the abdominal wall which results in tension- and fixation-free repair. In this study, the newly designed mesh was placed in 22 patients in the preperitoneal space by sublay technique in ventral or incisional hernias. After a midterm follow-up of 18-24 (mean 22) months, one infection occurred, which was managed successfully without mesh removal and three seromas developed. Till the end of their study no hematoma, chronic pain, or recurrence has been reported [47].

In a study in Rotterdam , IKAZIA hospital a retrospective analysis of 110 patients, Suture repair was shown to have a recurrence rate of 14% (n=98) after a mean follow up of 32 months. No recurrences were seen in patients with mesh repair (n=12) [6].

Drain was introduced in 7/15 (46.7%) of primary repair and in mesh group 31/35 (88.6%) P=0.003(Table -12). Also 5 out of 6 emergency group had drain postoperatively (Table -13). Immediate wound complications in the present study is negligible may be due to drain. Only one patient had seroma collection in late post operative period and repeated mesh infection which required mesh removal.

Some authors recommend drain while using mesh for umbilical hernia as it prevents seroma, hematoma and suppuration [71, 72]. Others suggest that leaving drain in all surgery is a potential risk factor for prosthetic infection [71, 73]. Rodrigo [26] opined that use of drain in 10 of 20 ORWM compared to no drain in 32 lap repair and one of 24 primary suture repair, accounting for more complications in ORWM group compared to others.

Umbilical hernia is one of the most common clinical sign (51%) associated with of Hypothyroidism in new born [15, 16]. 9 out of 50 recruits of the current study were hypothyroid which was statistically insignificant. Even after a thorough search, there was not much data available in the literature about the association of umbilical hernia and hypothyroidism in adults. (Table -16a and 16b). Out of these 9 cases, one developed recurrence after anatomical repair.

During the follow up, in the present study on 46 cases (4 lost to follow up) 2 recurrences occurred in 14 patients who had primary repair and no recurrences in the mesh group P=0.029 (Ref Table 17a). Recurrence rate is comparatively low in the present study may be because of use of mesh in majority of the cases (70%) and less duration of postoperative follow up.

Linas reported 8.6% recurrence mostly in open method [5]. Factors responsible for recurrence are surgical expertise, laparoscopic technique or open method with or without mesh, size of hernia, sac, BMI, post operative wound infections, postoperative increased intra-abdominal pressure due to respiratory complications and recumbency, liver cirrhosis and ascites.

Linas found higher body mass index and hernia >2cm as risk factors for recurrence. 10.5% for >2 cm where as 9% for <2 cm, similarly 8.6% for BMI < 30 and 10.7% for >30[5].

Arroyo found recurrence rate more in the open method 11% versus 1% in mesh and no correlation to size of the hernia or BMI. Muschaweck [68] on 210 cases all with mesh found no recurrence.

To conclude, aim of the hernia repair is not only to relieve pain but to prevent recurrences. Every hernia needs repair as complications in hernia are unpredictable, which includes incarceration, obstruction, and strangulation. Risk factors like, the factors which increase the abdominal pressure and obesity should be addressed. Repair technique should be individualised. Every hernia need not have a mesh repair, <3cm can be sutured with a primary suture repair. Hernia >3cm need to be repaired with prosthetic mesh for tension free repair, preferably laparoscopically. Post operative factors which increases intra-abdominal pressure and infection should be addressed to prevent recurrence.

Whether primary closure is rational in acute hernia for the fear of post operative complications is partially justified and is still a dilemma.

More controlled randomised study with systematic follow up, laparoscopic mesh repair, open repair with or without prosthetic mesh would be more informative in the management of umbilical hernia, which has gained less attention compared to other hernias and lack comparative studies.

SUMMARY

SUMMARY

This clinical study on paraumbilical hernia and management in adults conducted at Rajiv Gandhi Government General hospital. Consisting of 50 patients, with the mean age of 50.64 years (SD=15.46). 36 females and 14 males (P=0.002) and most of the married females are multiparous (32/36).

88.9% of females were less than 50 years but only 21.4% males were less than 50 years (P=0.005). Inferring that Umbilical hernia occurs more often in fertile, females at a younger age unlike males, where hernia occurs at later in age.

40% of the cases had history of the predisposing factors with no gender difference (P= 0.522). 9 cases were hypothyroid and there was no statistically significant association between hypothyroidism and umbilical hernia in adults.

More than half (27/50) of cases had medical co-morbidities which was more common in older age and males (71.4%). 30% (15/50) of the recruits were diabetic but without any statistical significance with regard to gender (P=0.185).

Previous history of abdominal surgery was present in 38% but none of the hernias were related to the previous surgery. Though not

statistically significant, family history of the hernia was present in 5 patients, of which 4 were males and one female.

14% had normal BMI, 42% were overweight and 44% were obese without any statistically significant correlation with age and gender.

Among 50 cases, 2 were asymptomatic, swelling with or without pain was present in 41, pain with or without swelling was present in 38. Only swelling was in 10 and only pain in 31. 10 out of 50 had obstructive symptoms. Though majority had complaints of pain (38/50), only 21 had tenderness.

Size of the hernia was <3 cm was in 20 recruits and >3cm was in 30 recruits. 14 empty sac, omentum was the content in 27 and bowel in 9.

Irreducible hernias was present in 13 and most these (12/13) presented with acute pain, nausea, vomiting and tenderness, were having >3 cm defect size (11 out of 13).

Mesh repair was done 35 and primary repair without mesh was done 15. 6 of the recruits underwent emergency surgery where as the remaining 44 were taken for elective surgery. Mesh repair was more in the elective and primary repair without mesh was more in emergency surgery group (P=0.007).

Majority of mesh group (88.6%) and about half of the primary repair group (46.7%) had drain postoperatively (P=0.003).

Immediate postoperative complications were strongly associated with Emergency surgery (P=<0.001), Hernia size >3cm (P=0.010) and irreducibility (P=<0.001).

In 46 patients who were followed-up to till the end of the study there were 2 (14.3%) recurrences in the 14 anatomical repair and no recurrences in the mesh group (P=0.029).

CONCLUSION

CONCLUSION

As the age advances medical co-morbidities may be associated more, including diabetes mellitus.

Swelling and pain were the common presenting complaints. Half of the cases were obese with equal prevalence both in men and women.

More than half of the hernias were larger than 3 cm and omentum being the most common content of the sac. Presence of obstructive symptoms in hernia larger than 3cm may be an indication of irreducibility.

Mesh repair and drain has been the preferred method in elective cases. This resulted in the lower incidence of seroma, hematoma and wound infection.

Immediate postoperative complications were strongly associated with 1.Emergency surgery, 2.Hernia size >3cm and 3.Irreducibility.

Use of mesh will definitely reduce the recurrence rate in adult umbilical hernia.

LIMITATIONS

LIMITATIONS

- Study sample size was small and inadequate for conclusive data and statistical analysis.
- Follow up period was inadequate, since the duration of study was less than 1 years.
- No randomisation of recruits into mesh and anatomical group was done, which could have improved the analysis.
- Laparoscopic repair was not included in the study for comparison.
- Post operative analgesia was not uniform among the recruits and the pain score allowed was purely subjective.
- QOL score and RTNA period score were not studied.

RECOMMENDATIONS OF THE STUDY

RECOMMENDATIONS OF STUDY

- A large multicenter trial is essential to have a larger sample to make the data more informative.
- A long term standardised follow up study for at least 5 years could be more authentic to find out late recurrences.
- Randomisation of recruits into mesh and anatomical group will definitely improve the outcome of the study.
- In this era of laparoscopic surgery, comparison between the Laparoscopic and open techniques will be more appropriate.
- Post operative analgesia should be made uniform for all the cases, QOL score and RTNA should be studied.

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APPENDICES

ETHICAL COMMITTEE CLEARANCE CERTIFICATE

INSTITUTIONAL ETHICS COMMITTEE
MADRAS MEDICAL COLLEGE, CHENNAI 600 003

EC Reg.No.ECR/270/Inst./TN/2013
Telephone No.044 25305301
Fax: 011 25363970

CERTIFICATE OF APPROVAL

To
Dr.Madhumitha.S.
II Year Post Graduate in MS General Surgery
Institute of General Surgery
Madras Medical College
Chennai 600 003

Dear Dr.Madhumitha.S,

The Institutional Ethics Committee has considered your request and approved your study titled **"STUDY OF ETIOLOGICAL FACTORS AND ANALYSIS OF VARIOUS SURGICAL REPAIR TECHNIQUES FOR PARAUMBLICAL HERNIA" - NO.01022017 (II)**

The following members of Ethics Committee were present in the meeting hold on **21.02.2017** conducted at Madras Medical College, Chennai 3

1.Dr.C.Rajendran, MD.,	:Chairperson
2.Dr.M.K.Muralidharan,MS.,M.Ch.,Dean, MMC,Ch-3	:Deputy Chairperson
3.Prof.Sudha Seshayyan,MD., Vice Principal,MMC,Ch-3	: Member Secretary
4.Prof.B.Vasanthi,MD., Prof.of Pharmacology.,MMC,Ch-3	: Member
5.Prof.K.Ramadevi,MD.,Director,Inst.of Bio-Che,MMC,Ch-3	: Member
6.Prof.S.Mayilvahanan,MD,Director, Inst. of Int.Med,MMC, Ch-3	: Member
7.Tmt.J.Rajalakshmi, JAO,MMC, Ch-3	: Lay Person
8.Thiru S.Govindasamy, BA.,BL,High Court,Chennai	: Lawyer
9.Tmt.Arnold Saulina, MA.,MSW.,	:Social Scientist

We approve the proposal to be conducted in its presented form.

The Institutional Ethics Committee expects to be informed about the progress of the study and SAE occurring in the course of the study, any changes in the protocol and patients information/informed consent and asks to be provided a copy of the final report.

Member Secretary – Ethics Committee

MEMBER SECRETARY
INSTITUTIONAL ETHICS COMMITTEE
MADRAS MEDICAL COLLEGE
CHENNAI-600 003

STUDY PERFORMA

Name:

Age:

Sex:

Occupation

IP number:

Date of admission, surgery and discharge:

Address and Contact no:

Symptoms and its duration:

Co-Morbid conditions

H/o chronic cough, if yes grade

H/o asthma, if yes grade

H/o COPD, if yes grade

H/o Constipation, yes /no

H/o prostatism, yes / no

H/o Hypothyroidism, if yes dose of thyroxine

Obstetric history:

Past medical history:

Past surgical history:

Family history:

Clinical features

BMI:

Vitals

Size of the hernia

Size of the defect

Reducibility

Tenderness

Contents

Complications

Laboratory data:

- total WBC count
- T3/T4/TSH

Imaging

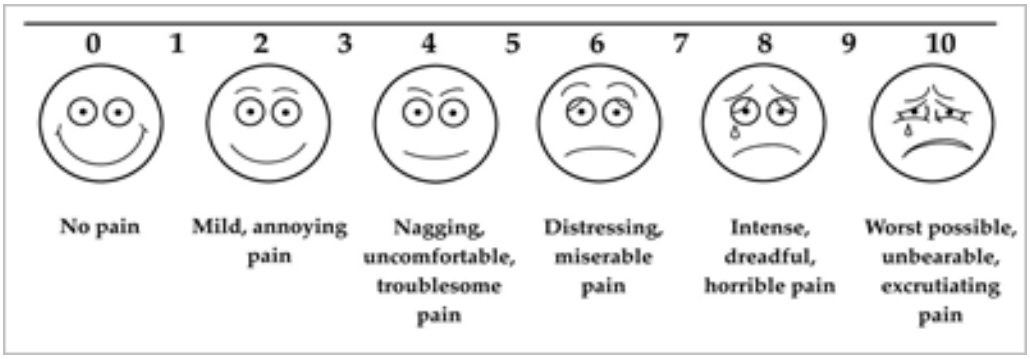
- Defect size
- Contents

Operative details:

Drain

Post op complications:

Post operative pain



POD 0:

POD 1:

POD 2:

Recurrence if any and Time of recurrence:

Total duration of follow up:

INFORMATION SHEET

We are conducting a study on **"STUDY OF ETIOLOGICAL FACTORS AND ANALYSIS OF VARIOUS SURGICAL REPAIR TECHNIQUES FOR PARA UMBLICAL HERNIA"** among patients attending Rajiv Gandhi Government General Hospital, Chennai

The purpose of this study is to assess

We are selecting certain cases and if you are found eligible, we may be using clinical profile, lab test reports and radiological reports for study purposes which does not affect your final report or management.

The privacy of the patients in the research will be maintained throughout the study. In the event of any publication or presentation resulting from the research, no personally identifiable information will be shared.

Taking part in this study is voluntary. You are free to decide whether to participate in this study or to withdraw at any time; your decision will not result in any loss of benefits to which you are otherwise entitled.

The results of the special study may be intimated to you at the end of the study period or during the study if anything is found abnormal which may aid in the management or treatment.

Signature of Investigator Signature of Participant / Guardian

Date :

Place:

ANNEXURE

MASTER CHART

SI NO	IP NO.	NAME	AGE	SEX	COMPLAINTS	PAIN	DURATION in YEARS	OBSTRUCTIVE SUMPTOMS	CHR COUGH?	ASTHMA / COPD	CONSTIPATION	PROSATISM	HYPOTHYROIDISM
1	35647	sujatha arun kumar	37	F	swelling	y	5	n	n	n	n	n	y
2	45214	abdul	60	m	swelling	y	4	y	n	n	n	n	n
3	65233	rex rita	45	F	swelling	n	7	n	n	n	n	n	n
4	54788	malliga	61	F	asymp	n	2	n	n	n	n	n	n
5	31459	rangan	64	m	swelling	n	3	n	n	n	n	y	n
6	47375	vishwanathan	82	m	swelling	y	1	n	n	n	n	y	n
7	63512	vincent	79	m	swelling	y	1	y	n	n	n	y	y
8	53767	Mary celine	89	F	swelling	y	3	y	n	y	n	n	n
9	36451	prem kumari	50	F	swelling	y	6	y	n	n	n	n	n
10	46312	ramlingam	71	m	swelling	y	1	n	n	n	n	n	n
11	86734	mathivanan	57	m	swelling	n	1	n	n	n	n	n	n
12	47512	kavitha	31	F	swelling	y	2	y	n	n	n	na	n
13	81346	baukkialakshmi	44	F	swelling	y	2	n	n	y	n	na	y
14	73976	ajmad begham	36	F	asymp	n	4	n	y	n	n	na	y
15	38564	s bose	44	m	swelling	y	2	n	n	n	n	n	n
16	86954	parveen sultana	30	F	pain	y	3	n	n	n	n	na	y
17	83296	salvarajan	57	m	swelling	y	2	y	n	n	n	n	n
18	63055	prabalavalli	42	F	swelling	y	7	n	n	n	n	y	n
19	86415	philomena	76	F	pain	y	1	n	n	n	n	n	n
20	64934	sujatha.b	34	F	swelling	y	5	n	n	y	n	n	n
21	82719	rajagopal	36	m	swelling	y	2	n	n	y	y	y	n
22	79357	sheela.s	36	F	swelling	n	13	n	n	n	n	n	n
23	80376	geetha	63	F	swelling	n	3	n	n	n	y	n	n

24	58682	ummilsithara	36	F	swelling	y	15	n	n	y	n	n	y
25	41869	vasundara sundaram	62	F	swelling	y	1	y	n	n	n	n	n
26	68076	alamelu	64	F	pain	y	2	n	n	n	n	n	n
27	89453	kalpana u	36	F	swelling	n	5	n	n	n	n	n	n
28	76187	mrs Ameena begam	38	F	swelling	y	4	n	n	n	n	n	n
29	63744	jeevalakshmi	41	F	swelling	y	3	n	n	n	n	n	n
30	72578	mrs meenakshmi	46	F	swelling	y	1	n	n	n	n	n	y
31	90486	susila k	46	F	pain	y	2	y	n	n	n	n	n
32	38734	prabha s	36	F	pain	y	3	n	n	n	n	n	n
33	32598	Ravi	56	m	pain	y	1	n	n	y	y	n	n
34	73891	lakshmanan s	65	m	swelling	y	2	N	N	n	y	y	n
35	48452	rukmini palaniappan	68	F	swelling	y	1	y	n	y	n	n	n
36	57211	roopa shenoy	35	F	pain	y	4	n	n	n	n	n	n
37	76259	saraswathi m	60	F	swelling	n	1	n	n	n	n	n	n
38	55287	mahalakshmi	52	F	swelling	n	2	n	n	n	n	n	n
39	88236	seethalakshmi	62	F	swelling	y	2	n	n	n	n	n	n
40	74845	ramakrishnan	44	m	swelling	y	1	n	n	n	n	n	n
41	90634	saroja k	36	F	swelling	y	3	n	n	n	n	n	n
42	51779	chithra f	35	F	swelling	y	1	n	n	y	n	n	n
43	73352	uganthi senthilvel	30	F	swelling	y	5	n	n	n	n	n	y
44	82091	berna F	35	F	swelling	y	3	n	n	n	n	n	n
45	64925	deepta raghavan	36	F	swelling	n	1	n	n	n	n	n	y
46	74588	padma v	65	F	swelling	y	2	y	n	n	n	n	n
47	67331	paneer selvam	71	m	swelling	y	4	n	n	n	n	n	n
48	80017	parvathi	36	F	swelling	y	6	n	n	n	n	n	n
49	60472	krishnaveni	65	F	swelling	y	5	n	n	n	n	n	n
50	52042	murallidharan G	52	m	swelling	n	4	n	n	n	n	n	n

NO	IP NO.	NAME	MEDICAL COMORBIDITIES	BMI	TSH	T3	T4	SIZE OF HERNIA (cm)	REDUCIBLE	TENDER	complications	EMERG/ELECTIVE	CONTENT
1	35647	sujatha arun kumar	n	25.71	4.86	109	8	6*4	r	y	n	elec	o
2	45214	abdul	y	30.38	3.8	92	7.4	4*4	ir	y	obs	emer	b
3	65233	rex rita	n	24.64	5.01	108	7.9	4*3	r	y	n	elec	o
4	54788	malliga	y	30.61	2.29	83	6.9	3*2	r	n	n	elec	o
5	31459	rangan	y	22.67	1.71	79	6.55	2*1	r	n	n	elec	o
6	47375	vishawanathan	y	28.84	2.22	107	7	3*2	ir	y	y ir	elec	o
7	63512	vincent	y	33.20	2.21	37	11.9	6*4	ir	y	y ir	elec	b
8	53767	Mary celine	y	26.56	2.7	97	11.5	7*6	ir	y	y ir	elec	o+b
9	36451	prem kumari	y	32.46	1.89	93.8	9.14	10*11	r	y	n	elec	o+b
10	46312	ramlingam	y	20.95	4.5	89	11.2	3*2	r	n	n	elec	o
11	86734	mathivanan	n	25.53	2.92	125	7.9	2.5*2	r	n	n	elec	o
12	47512	kavitha	y	20.02	3.01	67	7.9	3*2.5	ir	Y	ir	emer	o
13	81346	baukkialakshmi	n	52.71	16.7	74	3.9	7.5*10	ir	y	Stra n	emer	o+b
14	73976	ajmad begham	n	34.17	0.95	83	7.2	1.5*1	r	n	n	elec	n
15	38564	s bose	n	32.91	3.92	123	9.2	4*3	r	n	n	elec	o
16	86954	parveen sultana	n	27.05	5.63	106	6.7	6*4	r	n	n	elec	o
17	83296	salvarajan	y	29.37	0.03	108	11.9	6*5	ir	y	obs	emer	o
18	63055	prabalavalli	n	27.09	8.03	89	6.2	4*3	r	y	n	elec	o
19	86415	philomena	y	29.24	1.58	92	8.3	4*3	r	n	n	elec	o
20	64934	sujatha.b	n	37.48	2.62	104	7.5	3*2.5	r	y	n	elec	o
21	82719	rajagopal	y	29.13	4.19	119	6.5	2.5*2	r	y	n	elec	o
22	79357	sheela.s	y	32.44	3.02	94	6.2	4*3	r	0	n	elec	o
23	80376	geetha	n	26.01	4.52	97	7.6	2.5*2	r	n	n	elec	n
24	58682	ummilsithara	n	44.78	3.27	88	13.2	5*4	r	y	n	elec	b
25	41869	vasundara sundaram	y	30.46	3.82	69	8	6*3	ir	y	gan	emer	o+b
26	68076	alamelu	y	34.15	2.22	85	5.9	7*6	ir	y	y ir	elec	o+b
27	89453	kalpana u	n	28.30	4.86	101	6.3	4*3	r	n	n	elec	O

28	76187	mrs Ameena begam	n	31.62	3.06	88.7	9.21	3*2	r	n	n	elec	n
29	63744	jeevalakshmi	n	39.76	2.94	130	9	4*2	ir	n	y ir	elec	o
30	72578	mrs meenakshmi	y	32.04	3.2	122	10.7	3*2	r	y	n	elec	o
31	90486	susila k	y	30.10	2.5	77	12.1	3*2	r	n	n	elec	n
32	38734	prabha s	n	26.67	4.26	103	5.77	3*2	r	n	n	elec	n
33	32598	Ravi	y	28.57	2.28	73	11.9	2*2	r	y	n	elect	o+b
34	73891	lakshmanan s	y	27.29	2	81	12.8	3*3	r	n	n	elec	o
35	48452	Rukmini palaniappan	y	32	3.72	102	8.49	4*3	r	n	n	elec	n
36	57211	roopa shenoy	n	22.14	3.36	94	7.44	3*2	r	n	n	elec	n
37	76259	saraswathi m	n	28.08	3.7	78	5.85	4*3	r	n	n	elec	o
38	55287	mahalakshmi	n	30.40	2.06	96	6.5	8*4	ir	y	y ir	elec	o
39	88236	seethalakshmi	y	20.70	4.85	106	6.8	4*3	r	n	n	elec	n
40	74845	ramakrishnan	n	39.12	3.92	123	9.2	4*3	r	n	n	elec	o
41	90634	saroja k	y	25.77	5.58	178	9.5	4*3	r	n	n	elec	n
42	51779	chithra f	n	25.23	3.38	113	6.4	3*2	r	n	n	elec	n
43	73352	uganthi senthilvel	n	30.22	2.23	121	10.3	4*4	ir	n	y ir	elec	o
44	82091	berna F	n	26.29	3.4	113	7.6	4*3	r	y	n	elec	o
45	64925	deepta raghavan	y	26.02	6.77	103	6.8	3*2	r	n	n	elec	n
46	74588	padma v	y	29.68	3.69	136	12.6	6*4	ir	y	ir	emer	o+b
47	67331	paneer selvam	y	30.09	4.37	98	5.4	4*4	r	n	n	elec	n
48	80017	parvathi	y	24.77	2.02	179	8.9	3*2	r	n	n	elec	n
49	60472	krishnaveni	y	36.06	3.4	127	4.9	5*3	r	n	n	elec	o
50	52042	murallidharan G	n	28.66	3.9	131	4.6	4*3	r	n	n	elec	o

SI NO	IP NO.	NAME	OPERATIVE DETAILS	DRAIN	POST OP PAIN D1	POST OP PAIN D2	POST OP PAIN D3	post op complications	F/U PAIN	RECURRENCE
1	35647	sujatha arun kumar	mesh	y	2	2	0		n	n
2	45214	abdul	anatomical	y	4	2	2		n	n
3	65233	rex rita	anatomical	y	2	2	2		n	y
4	54788	malliga	mesh	y	0	0	0		n	n
5	31459	rangan	mesh	n	0	0	0		n	n
6	47375	vishawanathan	mesh	y	2	0	0	immediate post op restlessness	n	n
7	63512	vincent	anatomical	y	0	0	0		n	y
8	53767	Mary celine	mesh	y	4	4	2	acute asthama, omental bx adenoca? Expired on 07/07/14	n	n
9	36451	prem kumari	mesh	y	4	4	2		n	n
10	46312	ramlingam	anatomical	n	4	4	4		n	n
11	86734	mathivanan	mesh	y	2	0	0		n	n
12	47512	kavitha	anatomical	n	0	0	0		n	n
13	81346	baukkialakshmi	mesh	y	4	2	2	seroma 3months:recurrent wound infection mesh removed	n	n
14	73976	ajmad begham	anatomical	n	4	0	0		n	n
15	38564	s bose	mesh	y	2	0	0		n	n
16	86954	parveen sultana	mesh	y	4	2	0		y	n
17	83296	salvarajan	anatomical	y	2	2	0		n	n
18	63055	prabalavalli	mesh	y	2	2	2		n	n
19	86415	philomena	anatomical	n	4	2	2	post op MI+Pneumonia	n	n
20	64934	sujatha.b	mesh	y	4	2	0		n	n
21	82719	rajagopal	mesh	y	2	0	0		n	n
22	79357	sheela.s	mesh	n	2	0	0		n	n
23	80376	geetha	anatomical	n	2	0	0		n	n
24	58682	ummilsithara	mesh	y	2	2	2		n	n
25	41869	vasundara sundaram	anatomical	y	4	2	0		n	n
26	68076	alamelu	mesh	y	2	0	0		n	n
27	89453	kalpana u	mesh	y	2	2	0		n	n

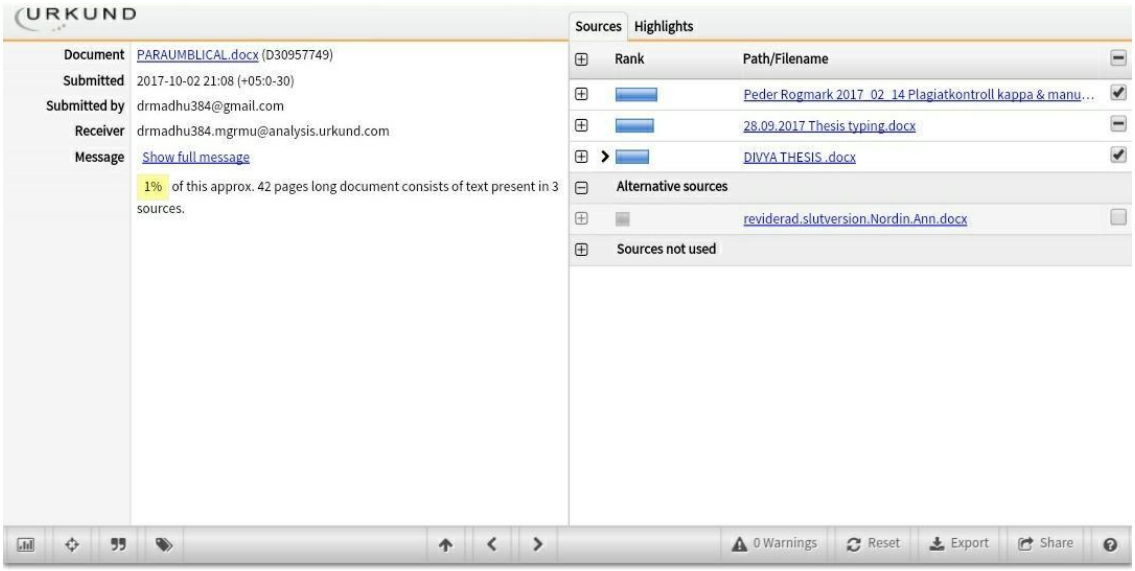
28	76187	mrs Ameena begam	mesh	n	2	0	0		n	n
29	63744	jeevalakshmi	mesh	y	0	0	0		y	n
30	72578	mrs meenakshmi	mesh	y	2	0	0		n	n
31	90486	susila k	mesh	y	2	0	0		n	n
32	38734	prabha s	mesh	y	2	0	2		n	n
33	32598	Ravi	anatomical	n	2	2	0	delayed GI recovery	n	n
34	73891	lakshmanan s	mesh	y	2	0	0		n	n
35	48452	Rukmini palaniappan	mesh	y	2	2	0		n	n
36	57211	roopa shenoy	mesh	y	2	0	0		n	n
37	76259	saraswathi m	mesh	y	2	2	2		n	n
38	55287	mahalakshmi	mesh	y	2	2	0		n	n
39	88236	seethalakshmi	mesh	y	2	0	0		y	n
40	74845	ramakrishnan	mesh	y	2	0	0		n	n
41	90634	saroja k	mesh	y	2	2	2		y	n
42	51779	chithra f	mesh	n	2	0	0		n	n
43	73352	uganthi senthilvel	anatomical	n	2	0	0		n	n
44	82091	berna F	anatomical	y	2	0	0		n	n
45	64925	deepta raghavan	anatomical	n	2	0	0		n	n
46	74588	padma v	anatomical	y	2	2	0		n	n
47	67331	paneer selvam	mesh	y	2	0	0		n	n
48	80017	parvathi	mesh	y	2	0	0		n	n
49	60472	krishnaveni	mesh	y	2	0	0		n	n
50	52042	murallidharan G	mesh	y	2	2	0		n	n

ABBREVIATIONS

LEGEND

M/F	-	MALE/FEMALE
Y/N	-	YES/NO
NP	-	NULLIPAROUS
MP	-	MULTIPAROUS
OBS	-	OBSTRUCTION
STRAN	-	STRANGULATION
ELEC	-	ELECTIVE
EMER	-	EMERGENCY
GAN	-	GANGRENOUS BOWEL
IR	-	IRREDUCIBLE
R	-	REDUCIBLE
O	-	OMENTUM
B	-	BOWEL

PLAGIARISM CERTIFICATE



A Dissertation on

"STUDY OF ETIOLOGICAL FACTORS AND ANALYSIS OF VARIOUS

SURGICAL REPAIR TECHNIQUES FOR PARA UMBLICAL HERNIA"

DISSERTATION IS

SUBMITTED TO

THE TAMILNADU Dr. MGR MEDICAL UNIVERSITY CHENNAI.

in partial fulfilment of the regulations for the Award of the degree of

M.S. (General Surgery)

Branch –

I

THE TAMILNADU DR.M.G.R.MEDICAL UNIVERSITY CHENNAI

APRIL 2018

BONAFIDE CERTIFICATE

Certified that this dissertation is the bonafide work of

Dr.MADHUMITHA.S.

"STUDY OF ETIOLOGICAL FACTORS AND ANALYSIS OF VARIOUS

SURGICAL REPAIR TECHNIQUES FOR PARA UMBLICAL HERNIA"

on during her M.S. (General Surgery) course from June 2015 to June

2018 at the Madras Medical College and Rajiv Gandhi Government

General Hospital, Chennai in partial fulfillment of the rules and

regulations laid down by The Tamil Nadu Dr. MGR Medical

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